MEASUREMENTS

UHF RADIO NOISE AND FIELD STRENGTH METER MODEL 58

Operating INSTRUCTIONS

MEASUREMENTS CORPORATION
BOONTON NEW JERSEY

MP MASTER
MA24701

OPERATING INSTRUCTIONS

for

MEASUREMENTS MODEL 58

TEST EQUIPMENT CALIBRATION
BRANCH
A.E.E.L. - N.A.D.C.

MEASUREMENTS CORPORATION
BOONTON NEW JERSEY

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IMPORTANT

MODEL 58 ERRATA

Since the publication of this Instruction Manual, several corrections in the text have been made as well as various changes in the Model 58. These corrections and revisions are explained in this Errata Section.

NOTE: To clarify a question asked by many Model 58 users, we wish to emphasize that as the instrument is calibrated in terms of microvolts in the antenna with a matched load, the voltage appearing across the line will be one-half that indicated by the meter.

Form 111-1M-9-50

ERRATA SHEET - MODEL 58

Par. 1.2(3) Sensitivity range should read "5 to 100,000 microvolts in the antenna".

Fig. 1.4 Type number of 9 inch loop should read A-110. Type number of 3 inch loop should read A-211.

Fig. 3-4 Caption should read, "Simple arrangement for instructing operators in the correct use of the loop probe".

Par. 3.611(4) Should read, "Obtain effective height from Figure 3-5 for doublet or loop antennas; for rod and probe see 3.621(4).

Par. 3.612(2) Same as 3.611(4).

Par. 3.621 Microvolt meter reading (peak) should be 54 x 100.

Par. 3.621 Effective height of antenna in meters should read "See Step (4) below" instead of (Figure 3-5).

Par. 3.622 Effective height of antenna in meters (Fig. 3-5) should read 1.04. Caption should read, "Microvolts (average) per meter $\frac{1 \times 40}{1.04} = 38.5$".

The following example should read, Effective height of antenna in meters (Fig. 3-5) 1.90.

Computation should read $\frac{1 \times 28 \times \frac{13}{20}}{1.90} = 9.6$

Par. 3.623 Frequency should be 75 Mc. instead of 25 Mc. The band specified in (4) should be D not B.

Note: On E band, dial multiplier K is X2 on most instruments (see footnote P-58).

Fig. 4-5 Variable coupling of T2, T3 and T4 is a manufacturing adjustment not to be disturbed.

Par. 5.72 Two 36 ohm resistors are not used. Substitute network shown in Fig. 5-6b for r-f alignment. A 0.002 mfd. capacitor is used for i-f alignment.

Par. 5.741(2) Figure 5-6 should read, "5-6b".

THE FOLLOWING CHANGES HAVE BEEN MADE IN THE "TABLE OF REPLACEABLE PARTS"

B5 - Bias Cell has been removed.
C44- Capacitor .05 has been removed.
R7, R10, R18, R24, R30 - Resistors, 35,000 ohms changed to 36,000 ohms.
R34- Resistor 3.5 meg. changed to 3 meg.
R37- Resistor has been removed.
R40- Resistor 7,500 ohms changed to 6,800 ohms.
R41- Resistor 5000 ohms changed to 4,700 ohms.
R49- Resistor 5,000 ohms changed to 3,000 ohms.
R51- Resistor 50,000 ohms changed to 51,000 ohms.
R54- Resistor has been removed. Add one resistor R71, 75 ohms ±5% 1/2 w.(Cathode res.V-4) Allen Bradley "EB".

TUBE	PIN	VOLTS	OHMS	CONDITION
V1 7W7 1st I-F	1 2 3 4 5 6 7 8	6.4 a-c + 250 + 130 0 0 0 + 2.2 ≠ 0	0 11,000 22,000 ∞ 0 .5-1.5 meg 700 ≠ 0	See Par. 5.21 5.22
V2 7Z4 Rectifier	1 2 3 4 5 6 7 8	0 0 350 a-c 0 0 350 a-c 0 6.4 a-c	0 0 95 ∞ ∞ 95 0 0	See Par. 5.21 5.22
V3 7W7 2nd I-F	1 2 3 4 5 6 7 8	6.4 a-c + 250 + 132 0 0 0 + 2.1 ≠ 0	0 12,000 22,000 ∞ 0 .5-1.5 meg 800 ≠ 0	See Par. 5.21 5.22
V4 6J5 Amplifier	1 2 3 4 5 6 7 8	0 6.4 a-c + 230 0 0 0 0 0	0 0 14,000 ∞ 2.5 meg ∞ 0 100	See Par. 5.21 5.22
V5 6Y6G Regulator	1 2 3 4 5 6 7 8	0 0 + 580 + 580 0 0 6.4 a-c - 0.2	0 0 ∞ ∞ .65 meg ∞ 0 10,000	See Par. 5.21 5.22
V6 7W7 3rd I-F	1 2 3 4 5 6 7 8	0 + 250 + 250 0 0 0 0 6.4 a-c	0 11,000 47,000 ∞ 0 0 440 0	See Par. 5.21 5.22
V7 6H6 Detector	1 2 3 4 5 6 7 8	0 0 0 0 0 0 6.3 a-c 0	0 0 6.5 meg 0 6.5 meg ∞ 0 0	See Par. 5.21 5.22

TUBE	PIN	VOLTS	OHMS	CONDITION
V8 6SJ7GT/G	1 2 3 4 5 6 7 8	0 6.3 a-c + 55 + 65 + 55 +105 0 +190	0 0 125,000 5-13K 125,000 22K 0 650,000	See Par. 5.21 5.22
V9 955 Oscillator	1 2 3 4 5	0 + 250 0 6.3 a-c 0	0 22,000 20,000 0 0	See Par. 5.21 5.22
V10 6AK5 Converter	1 2 3 4 5 6 7	* 0 0 6.3 a-c + 250 + 225 0	* 0 0 0 50,000 500,000 0	See Par. 5.21 5.22
V11 6AK5 R-F Amplifier	1 2 3 4 5 6 7	* 0 0 6.3 a-c + 250 0 0	* 0 0 0 50,000 600 0	See Par. 5.21 5.22
V12 Shot-Noise Diode M74	See Figure 5-1			Tube in Socket; ADJ Button in; Output Meter Reads in ADJ Area.
R-F Socket	1 2 3 4 5	6.4 a-c 0 + 250 6.4 a-c + 250	70 0 12,000 0 11,000	ADJ Button in ADJ Button in
Vibrator	1 2 3 4	0 4 a-c 4 a-c 0	0 ∞ ∞ ∞	Voltmeter on 0-10v a.c. range
Neon 991 Regulator	1 2	0 + 300	0 125,000	
Recorder Jack	All 3 Term	+ 190	22,000	No Tips in Jacks

*Bias cells were changed to 1.25 volts. See Par. 5.4 for test procedures.

≠Over a range of from + 0.7 to + 2.2 volts the resistance will vary from 320 to 700 ohms.

≠Over a range of from + 0.6 to + 2.1 volts the resistance will vary from 320 to 800 ohms.

Figure 5-2
Resistance and voltage measurements
(Replaces chart on Pg.45)

Fig. 3-4	Caption should read: "Simple arrangement for instructing operators in the correct use of the loop probe".
Fig. 4-5	Variable Coupling of T2, T3, and T4 is a manufacturing adjustment. Not to be disturbed.
5.72	Two 36 ohm resistors are not used. Substitute network shown in 5-6b.
5.741	Fig. 5-6 should read 5-6b.

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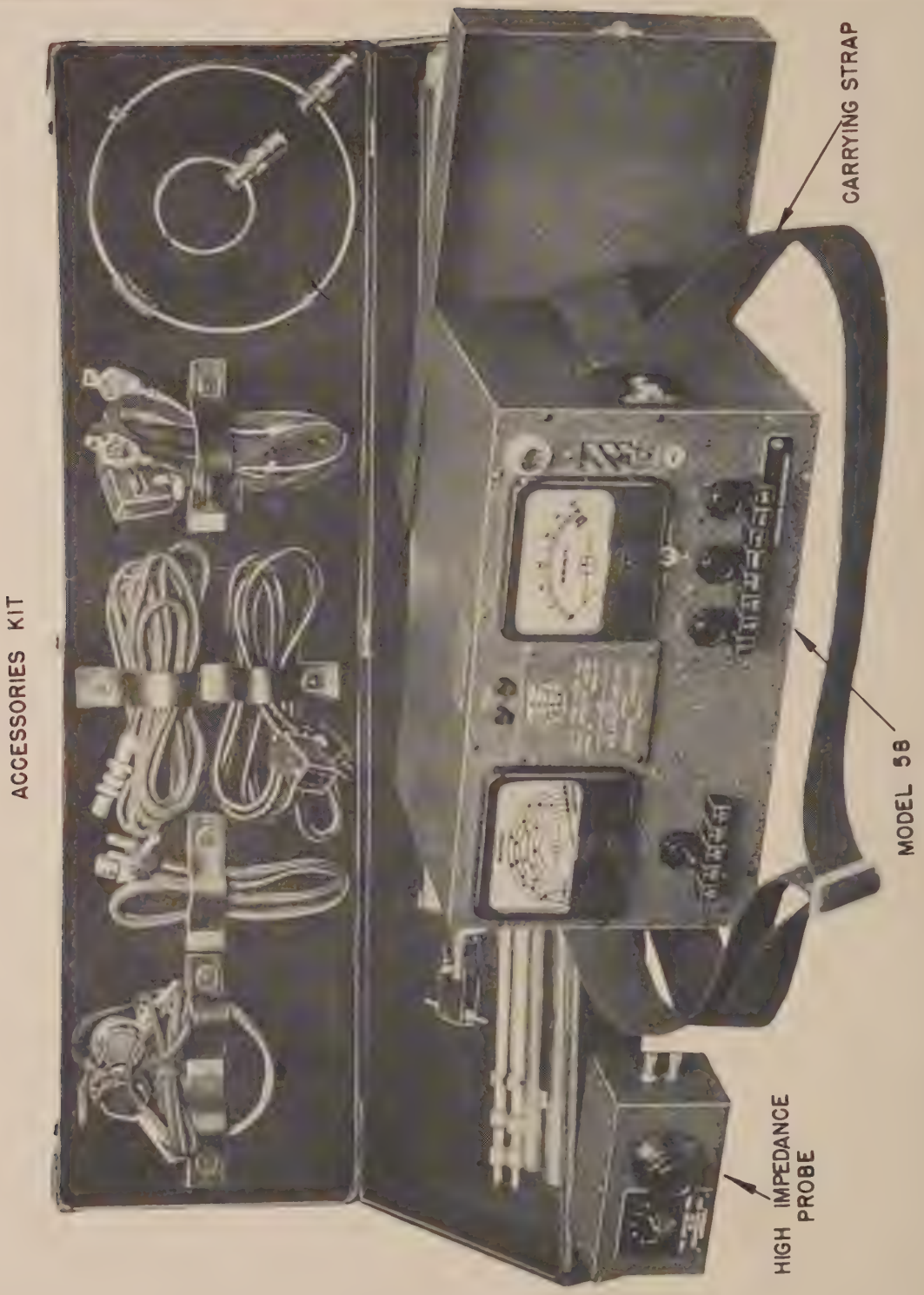

FIGURE 1-1
Model 58 UHF Field Strength Meter and its accessories

SECTION I

GENERAL DESCRIPTION

1.0 INTRODUCTION

This instruction handbook describes and defines the characteristics and performance, construction, basic operation, and maintenance of Measurements Model 58 UHF Radio Noise and Field Strength Meter (Figure 1-1). Sufficient data are included to afford a comprehensive study and review of the many applications that can be undertaken through the intelligent use and handling of the instrument.

1.1 PURPOSE

Model 58, operating either from the normal 117-v, 60 cycle standard a-c outlet or from a 6-v storage battery, enables the operator to explore and evaluate minute voltages relating to electromagnetic phenomena and their accompanying fields of disturbance in the frequency range from 15 to 150 mc.

It is a completely portable instrument that incorporates laboratory design features which make it a multipurpose device, suitable either for the measurement of steady carrier voltages or fields, as in field strength survey work, or for the evaluation of the nuisance value of noise voltages or fields, as in testing radiation from the ignition systems of motor driven vehicles. As a sensitive voltmeter, the Model 58 is useful for measuring line loss, front-to-back ratios of directional antennas, signal-to-noise ratios existing on various antennas, effectiveness of noise filters, etc.

Essentially, the instrument (Figures 1-1, 1-2) is a laboratory type, five band superheterodyne receiver with its gain standardized at a fixed value. Its characteristics are listed in paragraph 1.2. Indications are readable directly on a calibrated 0- to 100- microvolt meter, with provisions for headphone monitoring and recorder connections. To insure accuracy the instrument possesses a self-contained calibration circuit, a preselector stage having a high image rejection, a balanced-to-ground attenuator network and provisions for obtaining peak or average measurements of pulse or modulation voltages.

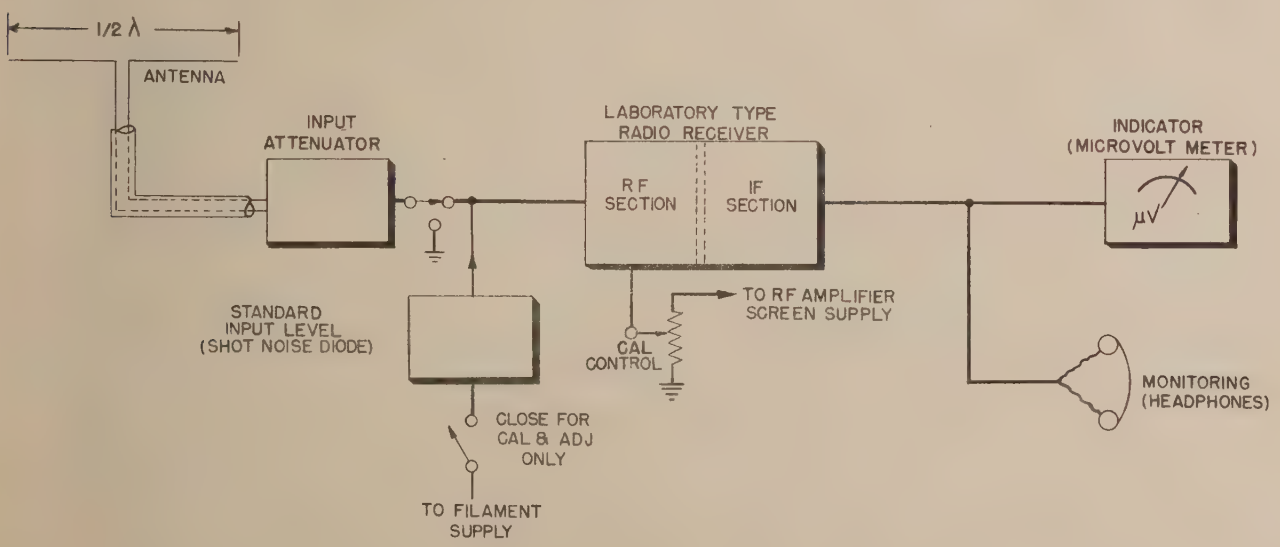

FIGURE 1-2
Model 58 simplified block diagram

1.2 CHARACTERISTICS

(1) Frequency range

15 to 150 mc in five bands as follows:

Band	Lowest Frequency (mc)	Highest Frequency (mc)
A	15	24
B	24	39
C	38	62
D	60	100
E	98	150

(2) Frequency calibration accuracy

2 percent.

(3) Sensitivity range

5 to 100,000 microvolts across 72 ohm input line.

SEE ERRATA SHEET, FRONT SECTION OF MANUAL

(4) Antenna input impedance

72 ohms, balanced-to-ground.

(5) Input attenuation

Four decade steps of constant impedance attenuation: X1, X10, X100 and X1000.

(6) Type of signal reception

Amplitude modulated, frequency modulated, pulse modulated, continuous wave, and noise. Can also measure television carrier at blanking level.

(7) Metering system

Semilogarithmic microvolt meter with choice of either peak or average response.

(8) Auxiliary indicators

Jack for connecting an external 5-milliampere recorder.

Jack for headphone or oscillographic monitoring of the signal.

(9) Sensitivity calibration

Self-contained shot-noise source of r-f signal provides a standard for comparison in correcting sensitivity vs frequency measurements. Required sensitivity adjustment is indicated on a calibration dial mechanically coupled to tuning mechanism.

(10) I-f selectivity

See figure 1-3.

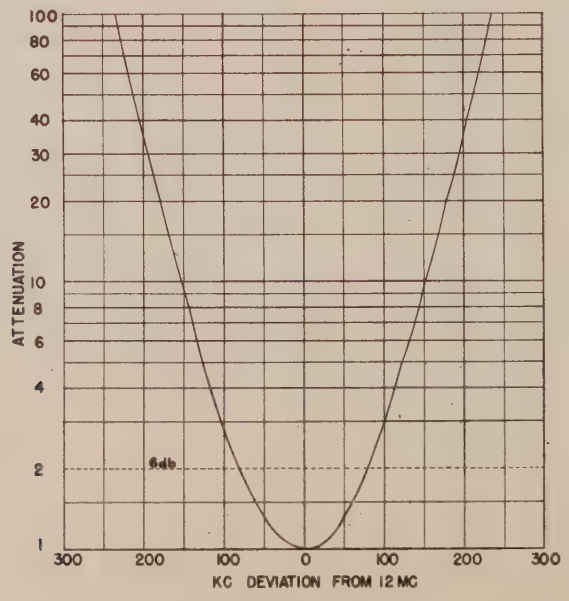

FIGURE 1-3
I-F selectivity curve - kilocycles deviation from 12 megacycles

(11) Image ratio	At least 60 db at carrier frequencies below 70 mc. At least 50 db at carrier frequencies above 70 mc.
(12) I-f rejection ratio	At least 50 db.
(13) Intermediate frequency	12 mc.
(14) Shielding	Sufficient for signals of any frequency and intensity within normal operating range. When the antenna is disconnected the indication of the output meter will decrease by a factor of at least 1000.
(15) Power supply system	
(a) Power source	Either 105 to 125 v, 50 to 60 cycle a-c or 6-v d-c.
(b) Power consumption (approx.)	
For a-c operation	70 watts at 117 v.
For d-c operation	12 amperes at 6 v.
For stand-by operation (battery connected but OFF push button depressed)	4 amperes
(16) Fuse protection	
(a) A-c	Two type 3AG, 1-1/2-ampere fuses in line plug.
(b) D-c	One type 3AG, 15-ampere fuse in battery cable.
(17) Physical characteristics	
(a) Weight (approx.)	34 lbs.
(b) Shipping weight	65 lbs.
(c) Height	9-1/4 inches
Width	16-1/2 inches
Depth	11-1/4 inches
(d) Weight of accessories and case (approx.)	20 lbs.
(e) Shipping weight	25 lbs.
(f) Length	40 inches
Width	10 inches
Depth	3 inches

1.3 TUBE COMPLEMENT

Schematic Symbol	JAN Type Designation	Title on Schematic	Function
V1	7W7	1st i-f	First i-f amplifier
V2	6X5 or 6X5GT/G	Rectifier	Full-wave rectifier for plate supply
V3	7W7	2nd i-f	Second i-f amplifier
V4	6J5 or 6J5GT/G	Amplifier	Amplifier for MICROVOLT meter, recorder and headphones
V5	6Y6G	Regulator	Used in combination with V8 for electronic regulation of the plate supply
V6	7W7	3rd i-f	Third i-f amplifier
V7	6H6	Detector	Rectifies i-f signal for avc and metering purposes
V8	6SJ7 or 6SJ7GT/G	Regulator	Used in combination with V5 for electronic regulation of the plate supply
V9	955	Oscillator	Heterodyne oscillator
V10	6AK5	Converter	Converts r-f signals to 12 mc i-f
V11	6AK5	R-f amplifier	R-f amplifier and preselector
V12	*M74	Shot-noise diode	Tube used as source of shot noise for calibration
Neon	991	Bias regulator	Provides constant bias voltage for V8

*Early Model 58's used the type 958 tube as a shot-noise diode with plate and grid tied together.

1.4 STANDARD EQUIPMENT SUPPLIED

The following is included with each shipment, unless otherwise specified in the order:

Quantity	Item	Type Number	Overall Dimensions (approx.)
1	Model 58 UHF Radio Noise and Field Strength Meter		Height 9-1/4 in. Width 16-1/2 in. Depth 11-1/4 in. Weight 34 lbs.
1	*A-c power cable	A107	Length 10 ft.
1	*Battery cable	A108	Length 6 ft.
1	*9-inch loop antenna	A110	Diameter 9 in.
1	*15-foot antenna cable	A112	Length 15 ft.
1	Carrying strap	A218	Length 8 ft.
1	Instruction book		

SEE ERRATA SHEET, FRONT SECTION OF MANUAL

1.5 OPTIONAL EQUIPMENT

1.50 General

Optional accessories can be purchased as required to realize the maximum utility of the Model 58. The optional and standard accessories listed in subparagraph 1.51 can be obtained as a unit. The case provides a means of securing each accessory in its proper place (Figure 1-4). Weight of case and contents is approximately 20 lbs.

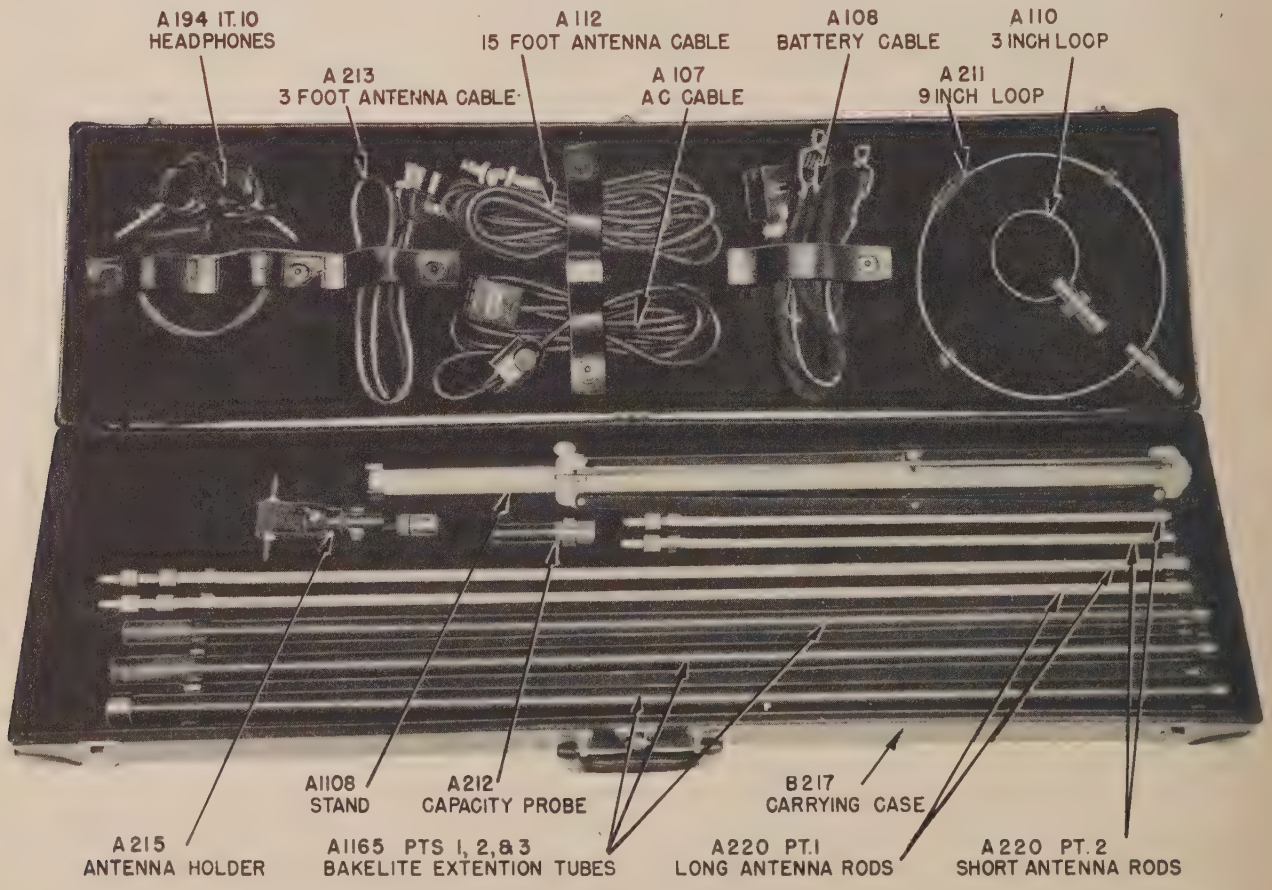

FIGURE 1-4
Accessory kit and case

*These standard accessories are contained in the accessory kit when the Model 58 and accessory kit are ordered together (Figures 1-1, 1-4).

1.51 Accessory Kit

Quantity	Item	Type Number	Overall Dimensions (approx.)
1	Accessory case	A214	40 by 10 by 3 in.
1	A-c cable	A107	Length 10 ft.
1	Battery cable	A108	Length 6 ft.
1	15-foot antenna cable	A112	Length 15 ft.
1	3-foot antenna cable	A213	Length 3 ft.
1	9-inch loop antenna	A110	Diameter 9 in.
1	3-inch loop antenna	A211	Diameter 3 in.
1	Capacity probe antenna	A212	Length 3-1/2 in.
1	Doublet antenna stand	A1108	Length folded 30 in.
1	Doublet extension tube	A1165, pt 3	Length 3 ft. Diameter 1 in.
1	Doublet extension tube	A1165, pt 2	Length 3 ft. Diameter 7/8 in.
1	Doublet extension tube	A1165, pt 1	Length 3 ft. Diameter 3/4 in.
1	Doublet antenna holder	A215	
2	Long antenna prods	A220, pt 2	Length, each 3 ft.
2	Short antenna prods	A220, pt 1	Length, each 1-1/2 ft.
1	Headphone assembly	Trimm #157, Cord and phone plug	

1.52 High-Impedance Probe

The Type B265 High-Impedance Probe (Figure 4-9) is a tunable transformer useful for coupling the Model 58 to an external circuit for measuring r-f voltages without disturbing the external circuit conditions.

Details covering the uses and circuit of the probe are discussed in paragraph 4.4. Instructions for calibrating the high-impedance probe will be found in paragraph 5-9.

1.6 ASSOCIATED EQUIPMENT

1.60 General

The accessories described below are not available from MEASUREMENTS CORPORATION. Information relating to these accessories is included in paragraphs 2.4, 2.5, 3.3, 4.334, 4.335, 5.112 and 5.113.

1.61 Storage Battery

Where an a-c source is lacking, any 6-volt storage battery capable of furnishing 12 amperes is suitable, such as the 6-volt battery used in automobiles. The d-c power cable is employed for making connections between instrument and battery.

1.62 Recorder

The Model 58 has provisions for use of a graphic recorder as an aid in making field strength surveys. The recorder used should employ a sensitive milliammeter carrying a direct current measuring element giving a full scale deflection on a current of 5 milliamperes and having a resistance not exceeding 550 ohms.*

Two phone tip plugs at least 7/8 inch long and a cable should accompany the recorder for connection to the two tip jacks marked RECORDER on the control panel.

1.63 Oscilloscope

To aid in studying noise patterns and in determining the nature of the signal, monitoring with an oscilloscope can be effected by direct application to the PHONE jack on the instrument panel. However, it should be remembered, in this connection, that the output system of the Model 58 is not designed for video amplification.

---

*If the resistance is less than 550 ohms it will be necessary to make up the difference as indicated in subparagraph 2.41.

SECTION II

INSTALLATION AND OPERATING PROCEDURE

2.1 INSTALLATION

Since Model 58 is portable test equipment no permanent installation is necessary. The shoulder carrying strap permits extreme mobility of this completely self-contained instrument to any desired location. A 6-volt d-c source is all that is necessary in the way of power requirement in the field, where a-c is not available. Selection, assembly and connection of the required antenna (paragraph 2.3) complete the installation proper.

A motor car or truck properly equipped with the Model 58 and desired associated apparatus is ideally suited for taking field measurements. The power source for operating the apparatus may be the car battery itself, or an extra battery carried along where measurements are taken while the car is in motion.

The instrument can measure any radiation field up to 100,000 microvolts per meter. Beyond 10,000 microvolts per meter, however, the shielding and filtering of the power supply leads may not be sufficient. Specific precaution for minimizing this difficulty is described in subparagraph 2.51.

2.2 SETTING UP THE EQUIPMENT

Exercise normal precautions when unpacking or handling the equipment case. Don't apply pressure to the meter glasses. While inspecting the equipment visually for damage after removal from the packing case, check the components against the master packing slip. If damage is evident note the nature, extent, and possible cause. Notify the express company concerned and MEASUREMENTS CORPORATION immediately.

After unpacking, disengage the carrying strap. Then remove the steel cover by unhitching the two side latch fasteners. Rest the instrument on its rubber foot mountings at some convenient height for meter reading, with the control panel either vertical or horizontal.

2.21 A-C Line Connection

(1) Depress the OFF button until the Model 58 is fully connected and ready for use.

(2) Insert the female connector end of the a-c power cable into the six-prong male plug on the Model 58 panel, pressing it flush against the panel. Observe guide pin and hole to facilitate the proper matching.

(3) Insert the male plug on the other end of the power cable into any standard 117-v, 60-cycle single-phase, a-c receptacle. Handle bakelite plug carefully; if broken obtain exact replacement. The power consumption is 70 watts.

CAUTION: DON'T CONNECT TO D-C OR TO 220-VOLT LINES

2.22 Battery Connection (where a-c power is not available)

(1) Depress the OFF button until the Model 58 is fully connected and ready for use.

(2) Insert the female connector end of the d-c power cable into the six-prong male plug on the Model 58 panel, pressing it flush against the panel. Observe guide pin and hole to facilitate the proper matching.

(3) Connect one battery clip to the positive terminal of the 6-v battery and the other clip to the negative terminal of the battery. D-c operation requires 12 amperes. If battery terminal voltage is less than six volts change batteries.

CAUTION: CONNECT ONLY TO 6-VOLT BATTERY. IF YOU USE PART OF A HIGHER VOLTAGE BATTERY YOU MAY INADVERTANTLY CONNECT TO MORE THAN SIX VOLTS.

2.3 CHOICE OF ANTENNA OR PROBE

2.30 General

For general field strength measurements in the range 28 to 150 mc it is advisable to use the doublet antenna. For mobile field strength measurements and for continuous measurement at fixed locations a specialized antenna is recommended. If further particulars are required write to MEASUREMENTS CORPORATION.

For noise measurements where space limitations are not a factor use the nine-inch loop. Where space limitations are a factor use the three-inch loop or the capacity probe.

Factors which determine the form of antenna to be employed are governed by:

(1) Polarization of field component to be measured;

(2) Nature of the field, whether of high or low intensity, frequency, etc.;

(3) Degree of convenience of handling the antenna.

Aside from use of the loop and doublet antennas supplied, a doublet specially constructed for the particular measurements may be employed. Other forms of antennas may also be used, such as the single vertical antenna with output between one end and ground, the spaced parallel plates with a short conductor between centers, and complex types of arrays. These can be calibrated in terms of one of the simpler antennas or in terms of a standard field.

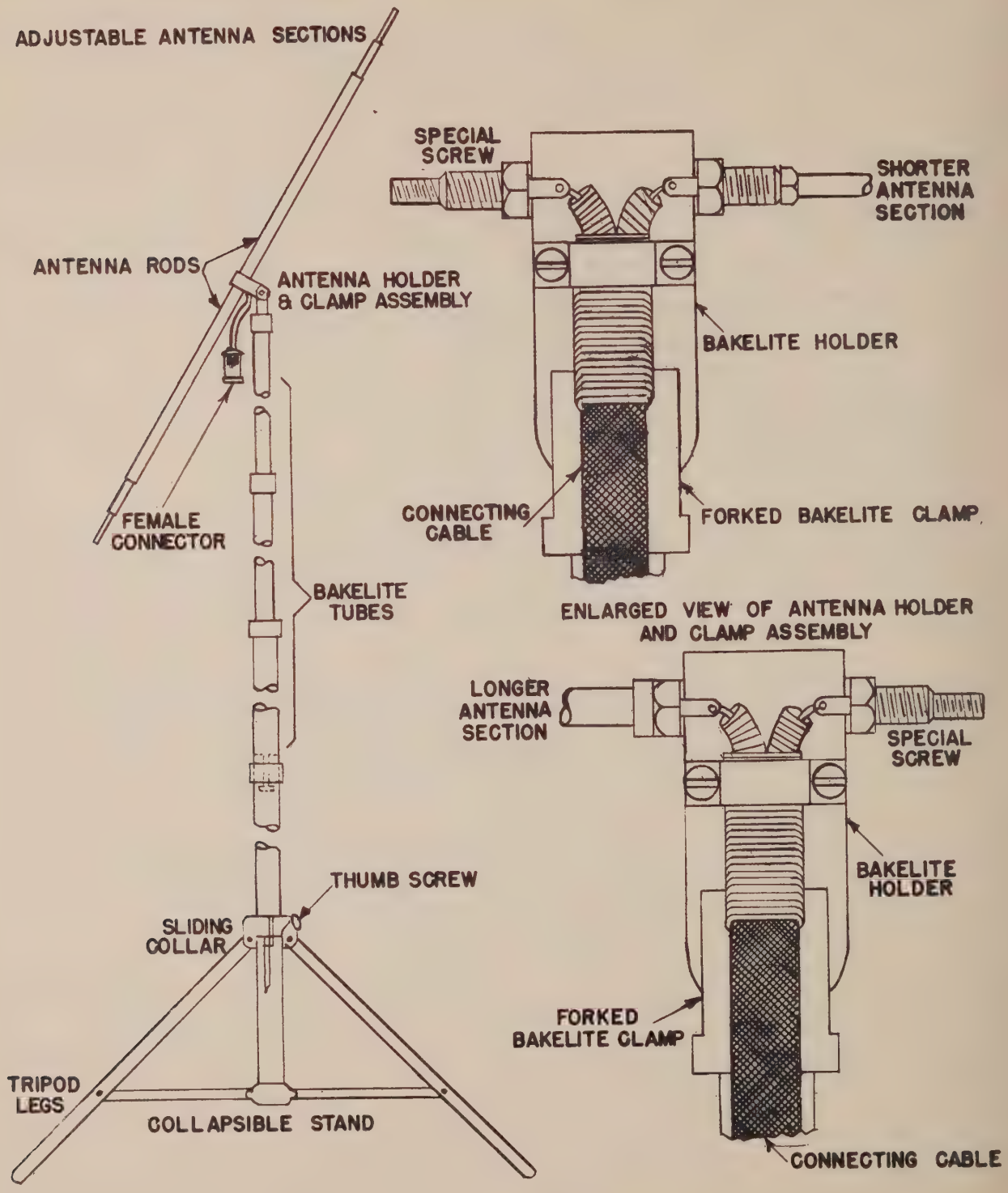

FIGURE 2-1

Doublet antenna and stand. Use clothesline guys to support antenna in high wind.

2.31 Antenna and Input System Chart

Probe or Antenna	Remarks	Effective height, intensity range, frequency	Space limitations	Setting up
9-inch Loop	Useful for a great variety of types of radio field strength measurements and noise voltage disturbances in space.	1 cm at 15 mc and 2.5 cm at 150 mc permitting measurements from 100 to 100,000 µv/meter at 15 mc and 400 to 100,000 µv/meter at 150 mc (Figure 3-5).	Easily and rapidly installed. Little space required for setting up and operation. No tuning required.	(1) Connect one end of antenna cable to ANTENNA input receptacle on Model 58. (2) Connect other end of cable to female connector on loop. Tighten locking ring securely (Figure 2-7).
3-inch Loop	Useful for determining direction of current flow and for locating leaks in ignition shielding and the like.	Effective height 1/10 that of 9-inch loop. 0.1 cm at 15 mc and 0.25 cm at 150 mc permitting measurements from 1,000 to 100,000 µv/meter at 15 mc and 4,000 to 100,000 µv/meter at 150 mc (Figure 3-5).	Use where size and space limit the use of the larger loop.	(1) Connect one end of antenna cable to ANTENNA input receptacle on Model 58. (2) Connect other end of cable to female connector on loop. Tighten locking ring (Figure 2-7).
Doublet Antenna	Permits measurement of lower field strength because of its increased effective height.	Effective height adjustable. Measurements from 1 to 50,000 µv/meter at 28 mc and 10 to 100,000 µv/meter at 150 mc (Figure 3-5).	Requires more space than loops. Less rugged than loop.	(1) Loosen thumb screw (Figure 2-1) on stand and spread legs. Tighten screw. (2) Fit antenna holder all the way into collar end of thinnest bakelite extension tube. (3) Select proper rods and adjust to length (Figure 2-2). (4) Thread one rod over each special screw on antenna holder (Figure 2-1). (5) Assemble remaining two bakelite tubes and slide over center rod of stand. (6) Connect one end of antenna cable to receptacle on antenna holder and other end to ANTENNA receptacle on Model 58. (7) Adjust for required degree of horizontal or vertical polarization and tighten wing nut. NOTE: Use rope or clothesline guys to support the doublet in high winds.
Capacity Probe	For locating and evaluating stray fields caused by ignition systems and by electrical and electronic apparatus.	Not calibrated for effective height.	Particularly adapted for use in restricted quarters. Easily and rapidly installed. No tuning required.	(1) Connect one end of antenna cable to ANTENNA input receptacle on Model 58. (2) Connect other end of cable to female connector on probe. Tighten locking ring securely (Figure 2-7).
High Impedance Probe	Useful for direct coupling in r-f voltage measurement and for using electrically short antenna (Figure 4-11).	No effective height data necessary. Probes may be individually calibrated as described in paragraph 5.9.		Connect up the probe in accordance with the particular application as discussed in paragraphs 3.3, 3.4, and 3.5.
3-Lead Antenna Connector	Useful for coupling to specialized antenna system and low impedance circuits.	Make comparison test with standard antenna.		Write to MEASUREMENTS CORPORATION if additional data are required.

NOTE: Orient the required antenna for maximum MICROVOLT meter reading -- dependent upon the polarization of the field.

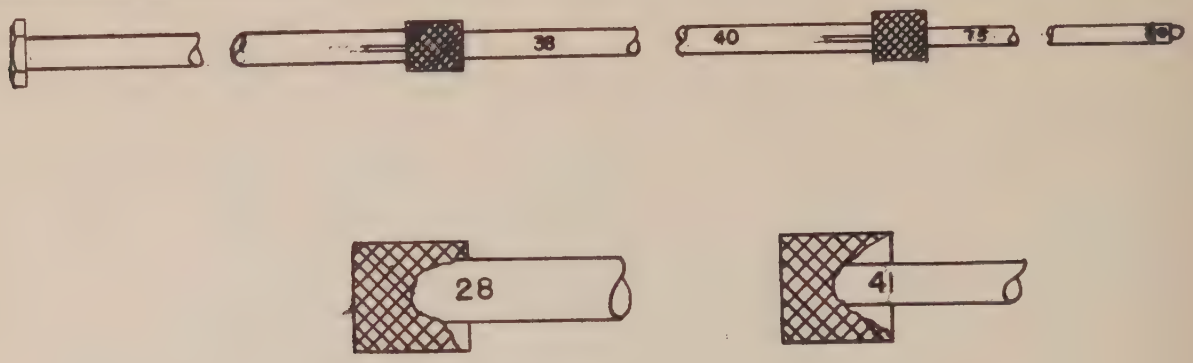

FIGURE 2-2

Antenna section engraving detail. The antenna rods are adjustable to half-wave length. Between 80 and 150 megacycles use the pair of two-section rods; extend each of inner sections until the number indicating the required frequency is just visible past the knurled nut. For frequencies between 28 and 80 megacycles use the three-section rods. Between 41 and 80 megacycles extend only the smaller section of the three-section antenna until the required frequency is just visible. Below 41 megacycles extend the next larger section until the required frequency is visible, leaving the inner section set at 41. Keep rods clean and lubricate with petroleum jelly. Replacement rods may be obtained from MEASUREMENTS CORPORATION.

2.4 CONNECTING ASSOCIATED EQUIPMENT

2.41 Recorder

2.410 General

Model 58 is suitable for making graphic plots of field strength measurements. For this use, the instrument has provision for connection of a recorder with characteristics mentioned in sub-paragraph 1.62. The recorder mechanism may be operated by a clock motor for plots of field strength vs time, for later conversion to distance, or the mechanism may be geared to the car speedometer to give a plot of field strength vs distance. Details for such operation may be obtained from the manufacturer of the recorder. (1)

If the resistance of the recorder employed is less than 550 ohms, make up the difference by adding the required resistance (1/2 watt) in series with the recorder.

2.411 Connection to Model 58

CAUTION: DEPRESS OFF BUTTON ON MODEL 58 BEFORE CONNECTING THE RECORDER TO PREVENT THE POSSIBILITY OF SHORT CIRCUITING CONNECTING LEADS TO THE CASE OR PANEL. 160 VOLTS EXIST BETWEEN JACKS AND PANEL.

(1) Depress OFF button.

(2) Insert the recorder connecting leads in the terminal jacks marked RECORDER on the Model 58 panel (Figure 2-3). The recorder leads must terminate in phonetips, at least 7/8-inch long.

(3) Depress ZERO button.

(4) Take measurements with Model 58 as outlined in paragraph 2.5.

(5) Operate recorder in accordance with manufacturer's instructions.

NOTE: The RECORDER terminal jacks on the Model 58 automatically complete the circuit on the removal of the phone tip connections. It is therefore not necessary to connect a jumper across them when the recorder is not in use.

(1) "The Graphic", Bulletin 339; and "Advancing the Chart by External Means", Bulletin 1240-A; and "Recording Field Strength", Bulletin 1037; all by Esterline Angus Company.

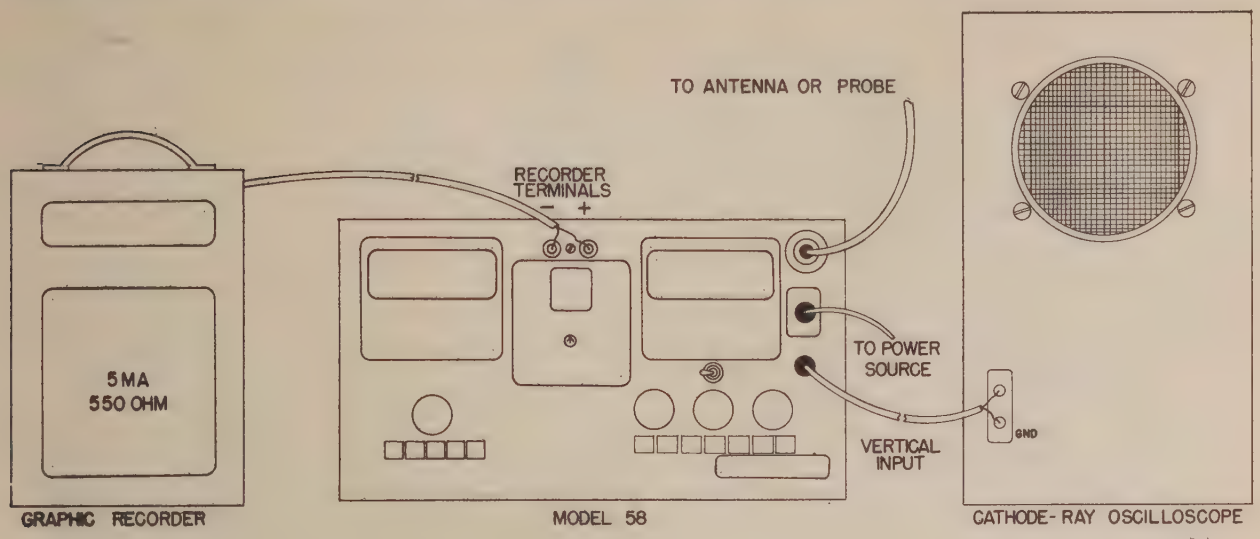

FIGURE 2-3
External connection to graphic recorder and/or oscilloscope

2.42 Oscilloscope

2.420 General

In making studies of noise voltages it may be desirable to monitor the signal visually on an oscilloscope. The Model 58 is suited to this type of work since an oscilloscope may be connected to the PHONES jack.

2.421 Connection to Model 58

(1) Connect the vertical deflection input of the oscilloscope to the PHONES jack on the Model 58 panel by a suitable length of wire as shown in Figure 2-3.

(2) Take measurements with the Model 58 as outlined in paragraph 2.5.

(3) Operate oscilloscope in accordance with manufacturer's instructions.

2.5 OPERATING PROCEDURE

2.50 General

Before taking any measurements the Model 58 must be calibrated for the particular frequency at which the measurements are made. The calibration procedure must be repeated whenever a large change of frequency is involved. This adjustment corrects for deviations in sensitivity vs frequency and calibrates the overall sensitivity of the instrument.

2.51 Setting Up and Calibrating for Particular Operating Frequency

(1) Set up and connect the equipment as outlined in paragraph 2.2.

(2) Depress the required frequency range button (Figure 2-4).

(3) Depress the ZERO button.

(4) Allow fifteen minutes for the Model 58 to warm up.

(5) During this warm-up period select and connect the required antenna and associated equipment, where used (paragraphs 2.3, 2.4), or make connection to the power line or network if such

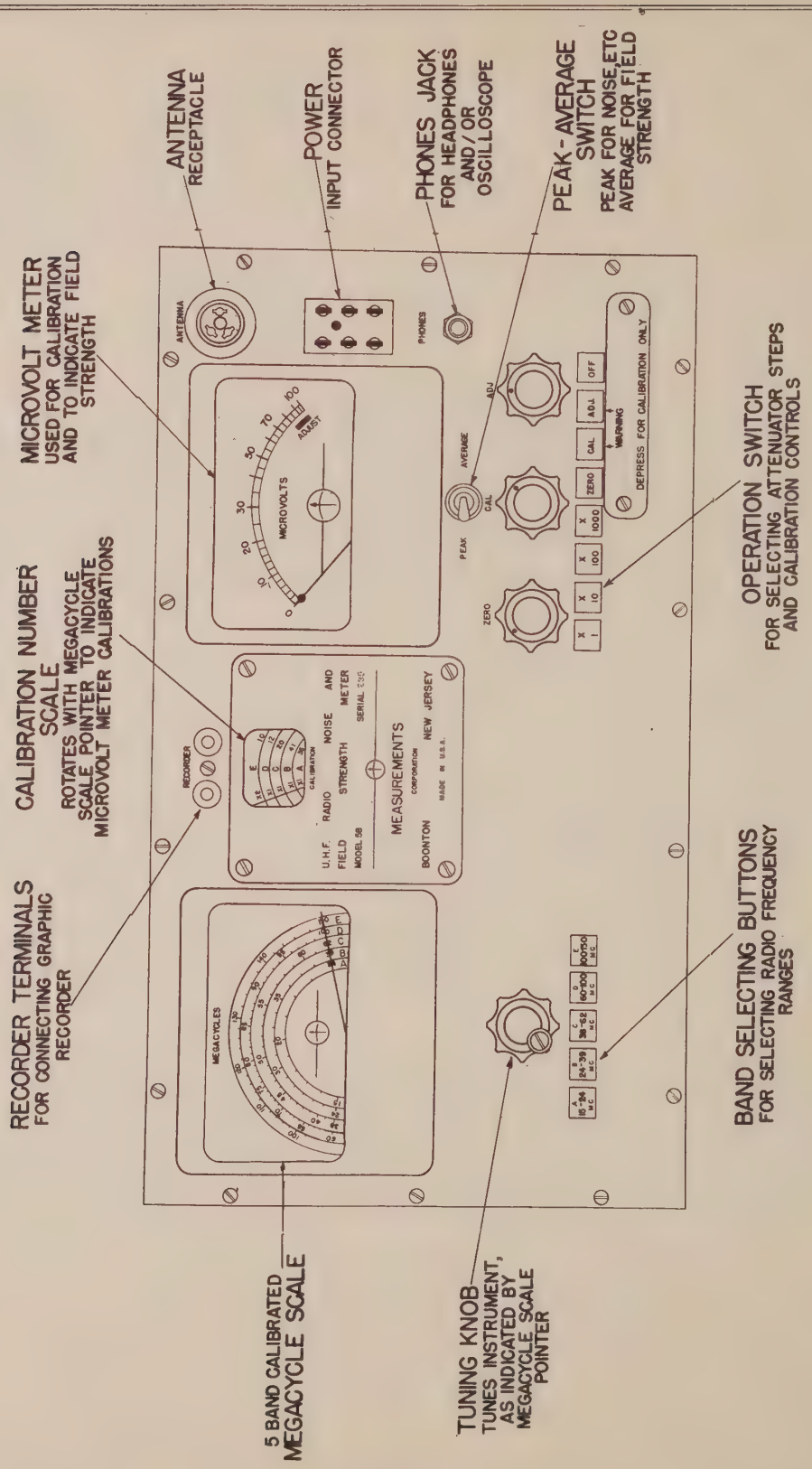

FIGURE 2-4
Panel controls and their functions

measurements are the subject of investigation. Use Figures 2-5 through 2-8 as a guide in connecting the equipment.

(6) Turn the ZERO knob clockwise. The MICROVOLT meter will swing upscale, indicating proper connection to the power source.

(7) Tune the MEGACYCLE scale pointer, by means of the knob beneath it, to the required frequency. Note the calibration number which appears on the CALIBRATION number scale (Figure 2-4) nearest the letter corresponding to the operating frequency range. This is to be used in instruction (10) below.

(8) Set PEAK-AVERAGE switch to AVERAGE; turn ZERO knob to set MICROVOLT meter pointer to zero.

CAUTION: STUDY INSTRUCTIONS FIRST AND PERFORM STEPS (9), (10) and (11) RAPIDLY SO AS TO PREVENT EXCESSIVE USE OF THE SHOT-NOISE TUBE. NEVER LEAVE CAL OR ADJ BUTTONS DEPRESSED FOR AN EXTENDED PERIOD.

(9) Depress ADJ button and operate ADJ knob to set the MICROVOLT meter pointer to lie somewhere within the black segment marked ADJUST.

(10) Depress CAL button and operate the CAL knob to bring the MICROVOLT meter pointer to the calibration number observed in instruction (7) above.*

(11) Depress ZERO button and turn ZERO knob to reset MICROVOLT meter pointer to zero.

(12) Repeat steps (10) and (11) until no further adjustment is necessary.

(13) Depress ZERO button.

NOTE: Unstable zero may be the result of operation in excessively strong fields. The filtering of battery leads or a-c line cord may not be sufficient to eliminate leakage in fields over 100,000 microvolts per meter. The remedy is to move the instrument and power source from direct vicinity of field. This instrument is primarily a low level device and no trouble with leakage should be evident with fields less than 10,000 microvolts per meter.

2.52 Operating Instructions

NOTE: Operate the equipment with due regard to the techniques and limitations set forth in Section III.

(1) Set up and calibrate the equipment for the particular frequency of operation as outlined in subparagraph 2.51.

(2) Snap the toggle switch to PEAK or AVERAGE in accordance with the requirements of the particular measurement. In general, PEAK is for noise measurements and AVERAGE is for radio field strength measurements.

(3) Depress attenuator buttons, starting with X1000 button and progressing to lower decade ranges until the MICROVOLT meter shows a deflection as close to full scale as possible.

(4) (a) For radio field strength measurements of carrier voltage, tune the MEGACYCLE pointer to the frequency in use.

(b) For noise and ignition measurements where tuning is not important, except for antenna resonance, swing the MEGACYCLE pointer back and forth in the range of interest to avoid a carrier that may be superimposed on the noise voltage. If readings remain substantially the same, carrier is absent. A sudden upswing of the meter pointer within the arc of the swing indicates presence of carrier. Detune slightly if carrier is present. Noise voltage remains fairly uniform over a considerable frequency range.

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*Where very accurate measurements are required interpolation is in order. This is accomplished by taking a distance ratio of the difference between two numbers visible in the CALIBRATION number window in the center of the instrument panel, and correcting for this difference. For example, if the dial position is such that the range letter is 1/3 of the distance between 35 and 38, but nearer the 38, the correction is 1/3 or -3, or -1. The calibration number is thus 38-1, or 37.

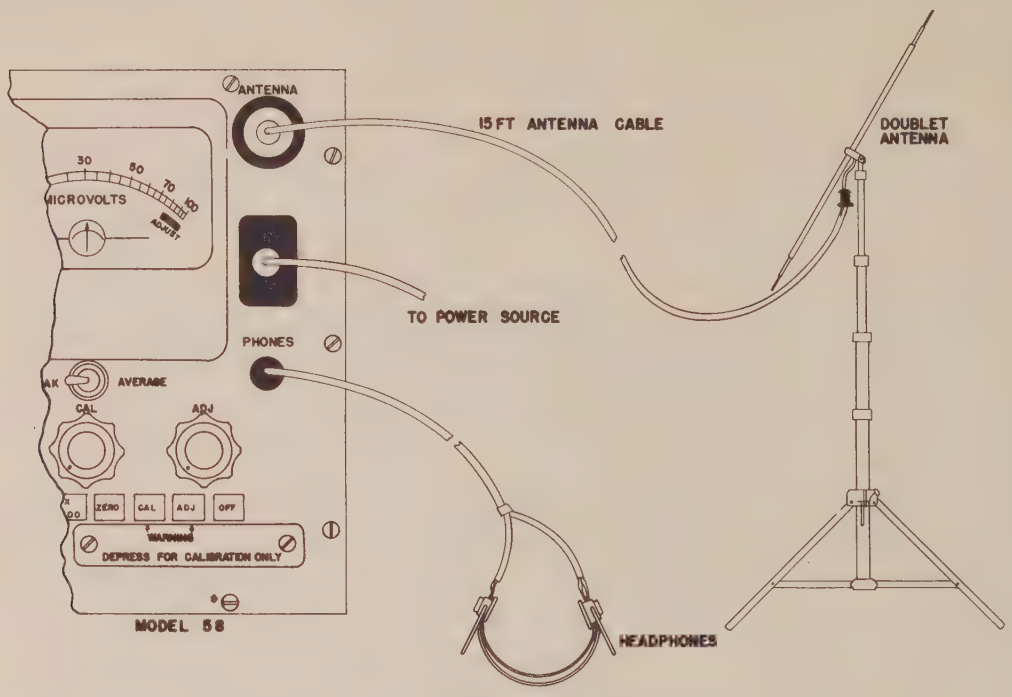

FIGURE 2-5

Field strength measurement. During such measurements orient the antenna for maximum MICROVOLT meter indication. For maximum accuracy take a few measurements in each area at least $\lambda/4$ apart to avoid reflection errors and other effects. Use the average. Use clothesline guys to support doublet in high wind.

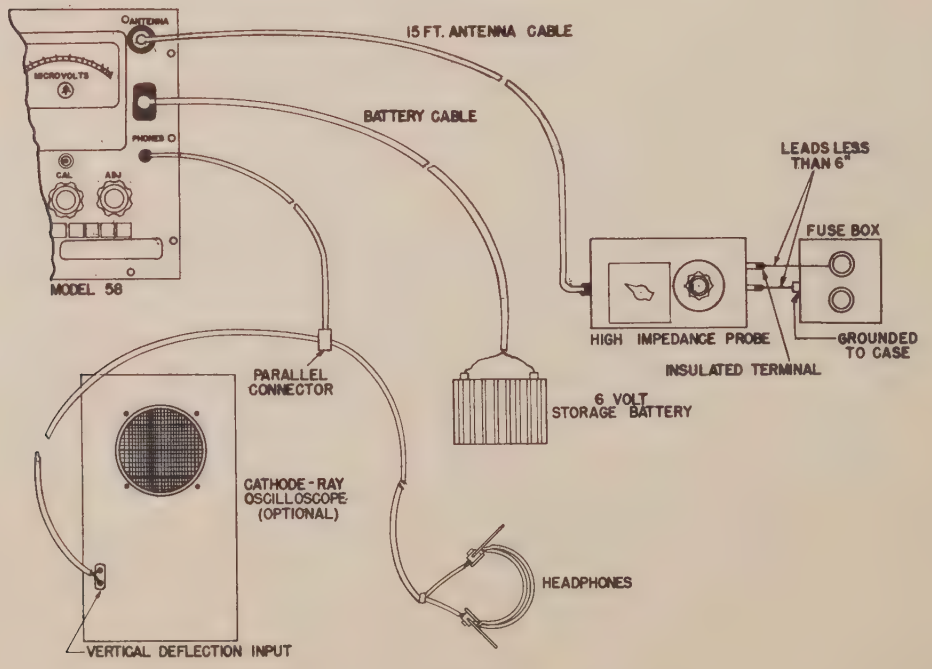

FIGURE 2-6

Power line measurement. Take measurement from each line to ground. Highest reading is significant one.

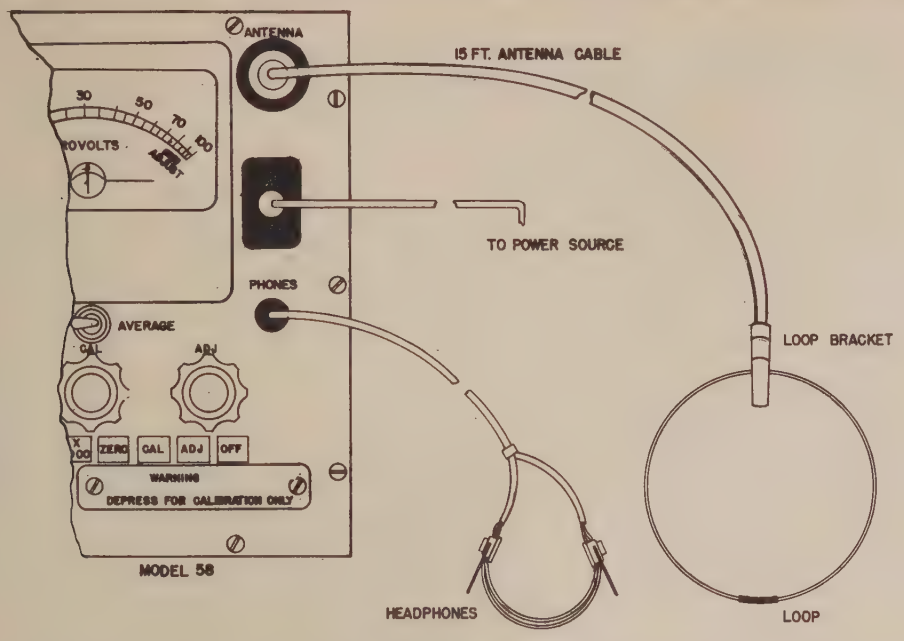

FIGURE 2-7
Radio noise measurement. Hold the loop by the bracket and avoid touching metallic or other conducting objects. See figure 3-4

(5) For intermittent voltage measurements (pulse signals), ignition noise, and the like, if the MICROVOLT meter reading is between 60 and 100, depress next higher attenuator button to check for overloading. Meter pointer should swing to 1/10 of its previous reading. If reading is higher than 1/10 of the original reading, overload was present. Record this new reading in such cases.

(6) Record readings only in the field for later computation and interpretation as outlined in Section III. Make sure that sufficient information is collected, such as time, location, frequency, MICROVOLT meter reading, type of connection, etc.

(7) Depress ZERO button and turn ZERO knob to reset MICROVOLT meter pointer to zero occassionally, during a long series of measurements. This is particularly necessary if Model 58 is battery operated because dropping battery voltage will cause shifting zero.

(8) Monitor the signal under investigation, if desirable, with a pair of headphones or with an oscilloscope (subparagraph 2.42).

(9) Depress OFF button to turn power off on a-c operation. Depressed OFF button permits battery stand-by operation. On battery operation disconnect the battery cable, when instrument is not in use, to turn the filaments off.

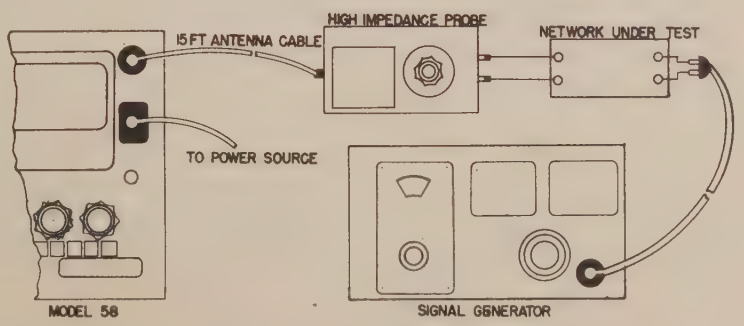

Figure 2-8
Measurement of voltage ratio of a four terminal network. It is usually advisable to make such measurements inside a shielded test room to avoid extraneous fields. Keep all leads as short as possible.

SECTION III

APPLICATION OF MODEL 58 AND INTERPRETATION OF RESULTS

3.0 GENERAL

The accuracy attainable in practice depends upon the design of the equipment, the conditions under which the measurements are taken, and the technique in operating the instrument. Under usual operating conditions the absolute accuracy may not be better than 40 percent provided the instrument is properly operated. This accuracy is sufficient for most applications.

3.1 RADIO NOISE INTERFERENCE AND PULSE MEASUREMENTS

The measurement of radio-noise interference and of pulse signals involves a number of factors which are not present when measuring c-w signals. The problem has been studied for a considerable period by the Joint Coordination Committee of the Edison Electric Institute, National Electrical Manufacturers Association, and Radio Manufacturers Association. The work of the Committee led to the conclusion that the best measuring apparatus is a diode detecting circuit with appropriately chosen values of the charge and discharge time constants. (1)(2)

Brief consideration (as pointed out in reference (2) below) reveals that the essential problem is to accommodate properly the greatly different wave forms, some being very highly peaked while others are practically sinusoidal. An idealized ignition pulse is shown in Figure 3-1. Actual ignition pulses do not consist of such simple wave forms but the operation of the circuit is similar. The shortest possible pulse width or mark-time that can be measured accurately is approximately 5 microseconds with a pass band of 150 kc (3). Pulses having a duration shorter than 5 microseconds will manifest reduced amplitude indications. The pulse passed by the i-f amplifier is rectified by a diode. The capacitor (C) shown in Figure 3-2, is charged during each mark period and discharged during each space period when the pulse is absent (Figure 3-3). The mark-space ratio of the pulse must be greater than the charge/discharge time constants of the peak detector circuit (1/600 in the case of the Model 58, conforming to RMA Standards for such types of radio noise measurement) or the peak value will not be indicated. Actually the peak value will only be approximated at best, since the pulse passed by the amplifier will be approximately triangular and not rectangular at 5 microseconds. The charge resistance (R) in this circuit (Figure 3-2) is not constant except for voltages over two or three volts. In the Model 58, the diode is operated up to 20 volts which corresponds with 100 microvolts on the MICROVOLT meter scale. At voltages lower than 3 (corresponding to approximately 10 microvolts antenna signal) the diode forward, or conducting, resistance rises to much higher values and the mark-space ratio approaches unity. At unity mark-space ratio the detector reads average value, of course.

When reading near 100 microvolts on the output meter, depressing the X10 attenuator button should cause a reduction of 1/10. This may not occur because of the changing nature of the diode conducting resistance which causes meter indications to be less than expected. Overload when measuring pulses short compared to five microseconds tends to cancel out the above discrepancy, thus causing the output meter to read higher than it should. To avoid this masking or cancelling effect, depress the next higher attenuator button and see whether overload is present. Overload is frequently encountered when

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(1) Report REX-1527A, August 15, 1945, by Radio Manufacturers Association Engineering Department.
(2) "Signal Measuring Devices", by Jerry Minter; Proceedings of the Radio Club of America, page 13, Volume 18, No. 2, February, 1941.
(3) "Selective Side-Band Transmission in Television" by R.D. Kell and G.L. Fredendall; RCA Review; Volume IV, No. 4; April, 1940.

probing the induction field in the vicinity of the ignition distributor, etc., since the induction field has a much steeper wave front and is of shorter duration than the radiated field.

3.2 RADIO FIELD STRENGTH MEASUREMENTS

Measurement of radio field strength with the Model 58 involves measuring the voltage induced across a standard antenna by the field to be measured and computing the radio field strength from the measured voltage and the effective height of the antenna. By definition the effective height of an antenna is the length in meters between the effective current centers (paragraph 4.1). It is customary to assume a sinusoidal distribution of current in the $\frac{\lambda}{2}$ doublet which means that the effective height = $\frac{\lambda}{\pi}$, where λ is the wave length in meters. This value is plotted in Figure 3-5. The effective height (h) of a loop antenna in meters can be calculated from $h = 2\pi n\frac{A}{\lambda}$, where n is the number of turns and A the area of the loop in square meters. In the case of the Model 58, it is necessary to take into account the loss due to reflection from the untuned loop. The effective height curves shown in Figure 3-5 include this experimentally determined factor.

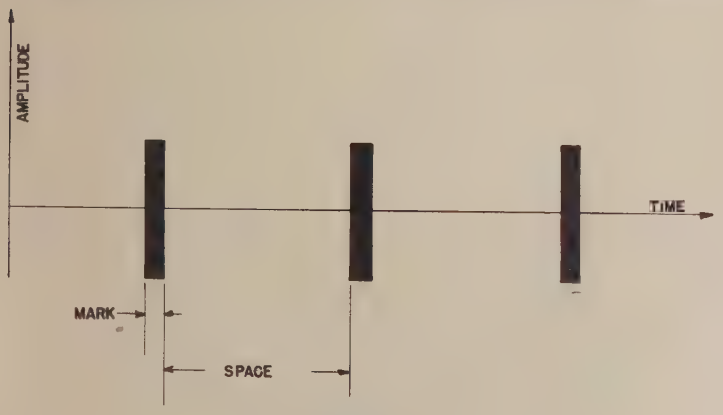
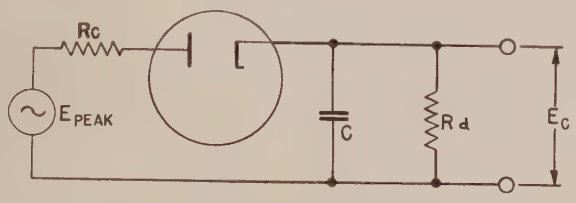


FIGURE 3-1
Idealized ignition pulse

The loss in the 15-foot antenna connecting cable is negligible up to 150 mc. If longer cables are to be used it may be advisable to measure and correct for their transmission loss. The effective height data in Figure 3-5 for the loops will not apply to cables other than the standard 15-foot length.



$$\frac{R_c C}{R_d C} = \frac{1}{600}$$

FIGURE 3-2
Diode circuit for r-f noise measurement

The half-wave doublet is a satisfactory antenna for most field strength measurements. When measuring field strength, orient the antenna about the horizontal and vertical axis for a maximum reading, since the maximum reading usually is considered most significant. It is also well to take readings spaced approximately $\frac{\lambda}{4}$ apart to determine whether a reading is being taken in a uniform field or not. The presence of nearby trees, wires, fences, vehicles, persons, etc., may disturb the field pattern and give false readings of the true field strength.

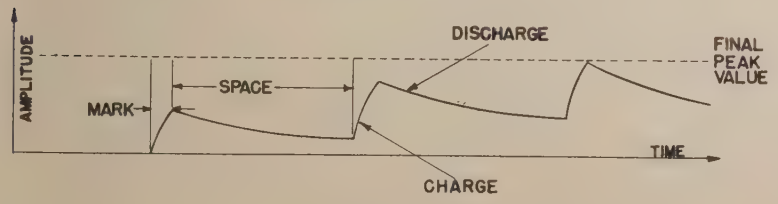
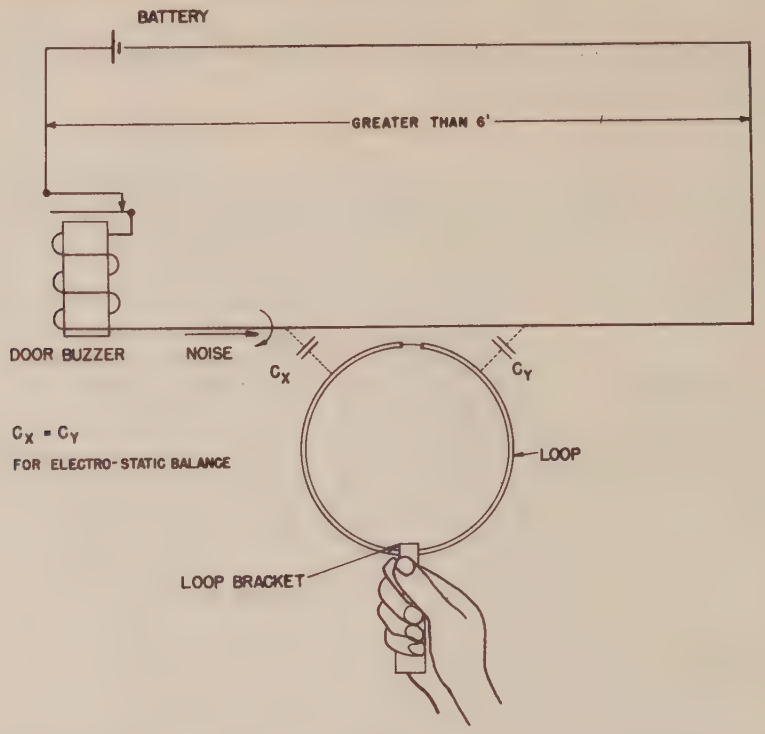
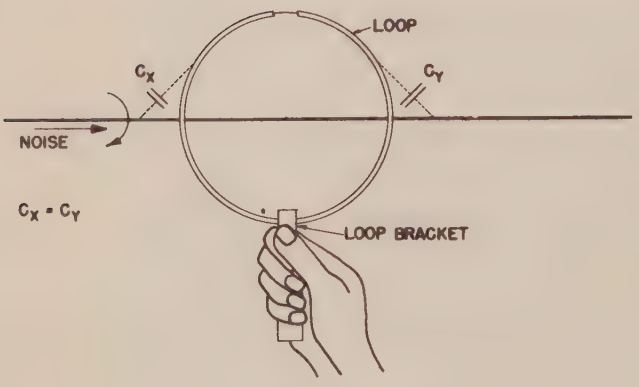


FIGURE 3-3
Rectified ignition pulse

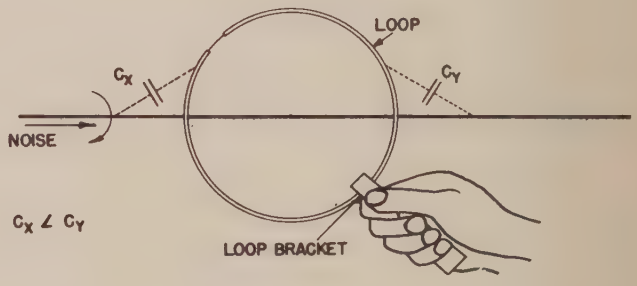
The adjustable doublet antenna furnished as an accessory to the Model 58 is continuously tunable from 28 to 150 mc. For measurements below 28 mc special methods, as mentioned in subparagraph 2.31 should be used.



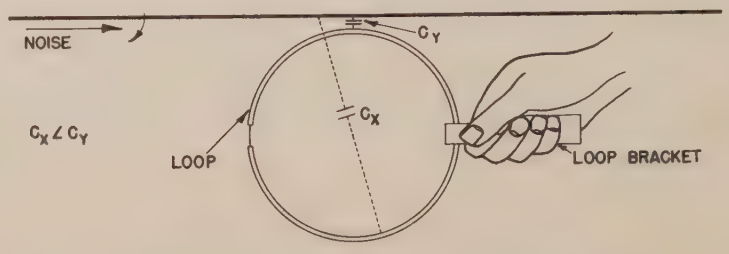
(a) Right method: Maximum indication with static balance obtained.



(b) Right method: Null; indication with static balance obtained.



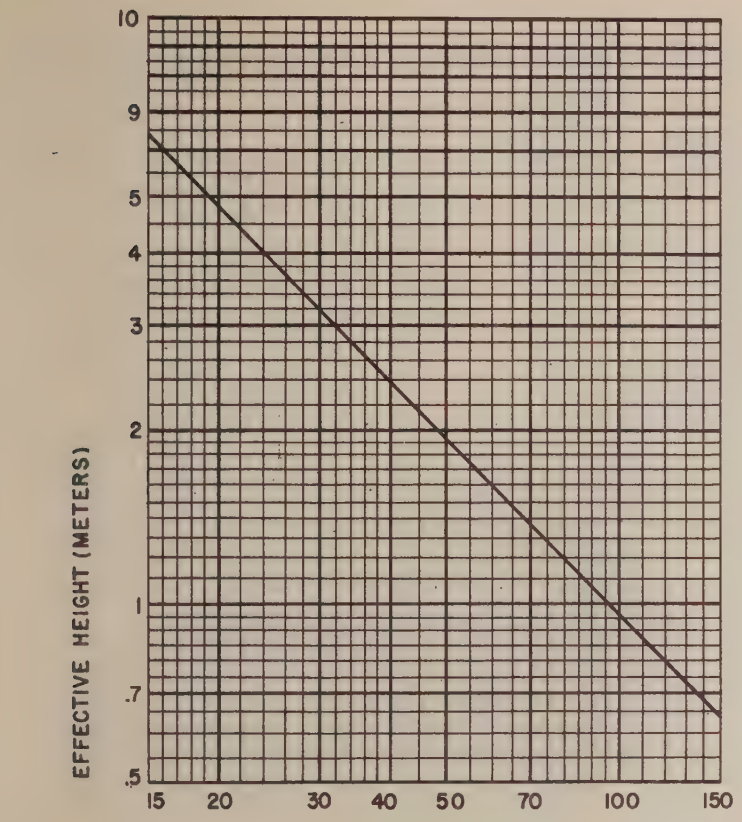
(c) Wrong method: Cx not equal to Cy and null obscured by static unbalance



(d) Wrong method: Cx not equal to Cy and maximum value will be modified by static unbalance

FIGURE 3-4
Obtaining electrostatic balance with loop

SEE ERRATA SHEET, FRONT



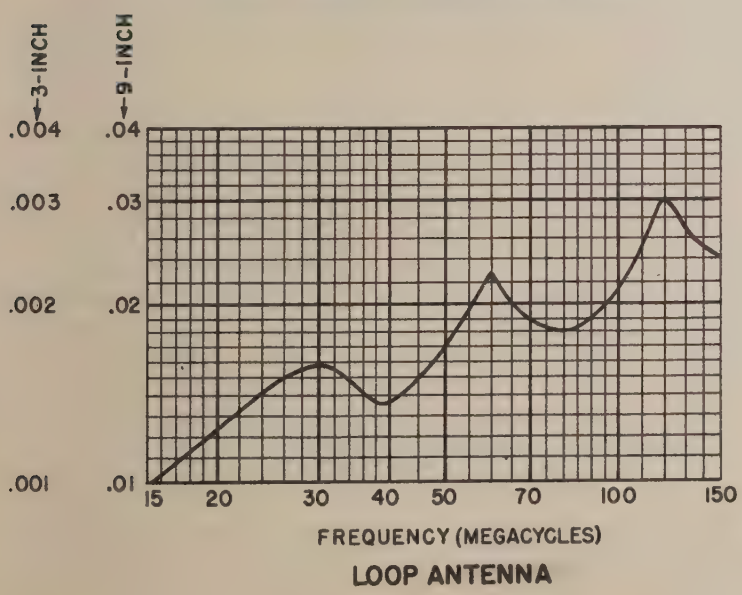


FIGURE 3-5
Effective height curve

It has been found necessary to sacrifice some gain in the input circuit of the Model 58 to minimize the effects of input circuit impedance variation on the transmission line termination. A compromise has been used which reduces the sensitivity by approximately 6 db or 2 to 1 and holds the first step of attenuation between approximately 8X and 12X. The limiting factor in sensitivity lies in the signal-to-noise ratio in the antenna circuit and the fact that it is not possible to utilize the maximum gain of the receiver because a margin of reserve must be allowed for calibration or standardization purposes.

Where greater sensitivity is desirable it is possible to calibrate the Model 58 at higher equivalent microvolts of shot noise if sufficient gain can be obtained. To accomplish this use a higher calibration number during the calibration procedure (subparagraph 2.51). Correct for this in the final calculations by multiplying by the ratio of $\frac{\text{original calibration number}}{\text{higher calibration number}}$ A typical computation is shown in subparagraph 3.622.

At some frequencies it is possible to calibrate at twice the equivalent microvolts and thus obtain twice the sensitivity. This procedure is limited by the signal-to-noise existing at the plate of the r-f amplifier tube. In this connection the screen voltage control provides the most suitable method of gain variation consistent with the highest signal-to-noise ratios.

Radio field strength measurements of pulse modulated signals of television transmitters are considered on the same basis as other pulse and intermittent signals discussed in paragraph 3.1. The Model 58 will read slightly above the blanking level and therefore will not vary with picture brightness.

3.3 POWER LINE NOISE MEASUREMENTS

The measurement of power line noise involves similar factors to those which are present when taking measurements of radio noise and pulse signals in space. The design of the Model 58 takes these factors into consideration as described in paragraph 3.1.

Line-to-line readings are not very significant. However, they can be taken with the Model 58 if it is insulated from ground. For most purposes it is advisable to take two readings, one from each line to ground with connections as shown in Figure 2-6. The higher intensity obtained is the significant one. These readings should be taken with PEAK-AVERAGE switch in PEAK position. For this type of measurement the instrument must be operated from a battery source or from a supply wholly independent from that on which the measurements are to be taken. The high-impedance probe serves to couple the line to the input of the Model 58. (See Figures 3-4a, b, c, and d for right and wrong methods of getting electrostatic balance when using loop probes.)

CAUTION: NEVER CONNECT THE POWER LINE DIRECTLY TO 3-TERMINAL ANTENNA CONNECTOR.

3.4 VOLTAGE RATIO MEASUREMENTS

The Model 58 can be used in conjunction with a suitable standard signal generator to measure the transmission loss of four terminal networks such as interference filters, band pass filters, etc.; front-to-back ratios of directional antennas; signal-to-noise ratios existing on antennas; and the like. In most of these cases the Model 58 will provide more reliable indications than an untuned type of voltmeter. For such measurements the Model 58 is simply used as a sensitive tuned direct-reading voltmeter. For example, the front-to-back ratio of the directional antenna may be obtained by connecting the Model 58 to the antenna output and merely reading both voltages directly. Signal-to-noise ratios can be measured by connecting the Model 58 to the antenna output, measuring the signal, detuning from the signal and then measuring the peak value of the noise existing in the absence of the signal. Attenuation factors and the effectiveness of filters are measured as shown in Figure 2-8.

It is advisable to check the calibration of Model 58 together with the high-impedance probe (subparagraph 5.91) since the accuracy of a good signal generator exceeds the absolute accuracy of the Model 58. The relative accuracy of the Model 58 is good as long as the meter is read well up on the upper half of the scale. Adjust signal intensity when possible to keep the meter pointer well up on the scale.

3.5 MODEL 58 AS R-F VOLTMETER

The Model 58 can be used as a tuned vacuum-tube voltmeter for measuring any r-f voltage from 5 microvolts to 0.1 volt in the range from 15 to 150 megacycles. For such measurements use the high-impedance probe to couple the instrument to the circuit under investigation with as short a wire as possible between the probe and the circuit. Tune the Model 58 and the high-impedance probe to resonate at the frequency of the measured circuit. A typical result is shown in subparagraph 3.626.

3.6 INTERPRETATION OF RESULTS

3.60 General

As far as the operator is concerned the considerations discussed in paragraphs 3.1 through 3.5 must be translated into numerical factors which can be used to compensate the readings listed in his record chart.

The field intensity in microvolts per meter at a particular frequency and location is the result required. To obtain this result from the MICROVOLT meter reading follow procedures outlined in the typical examples in subparagraph 3.61.

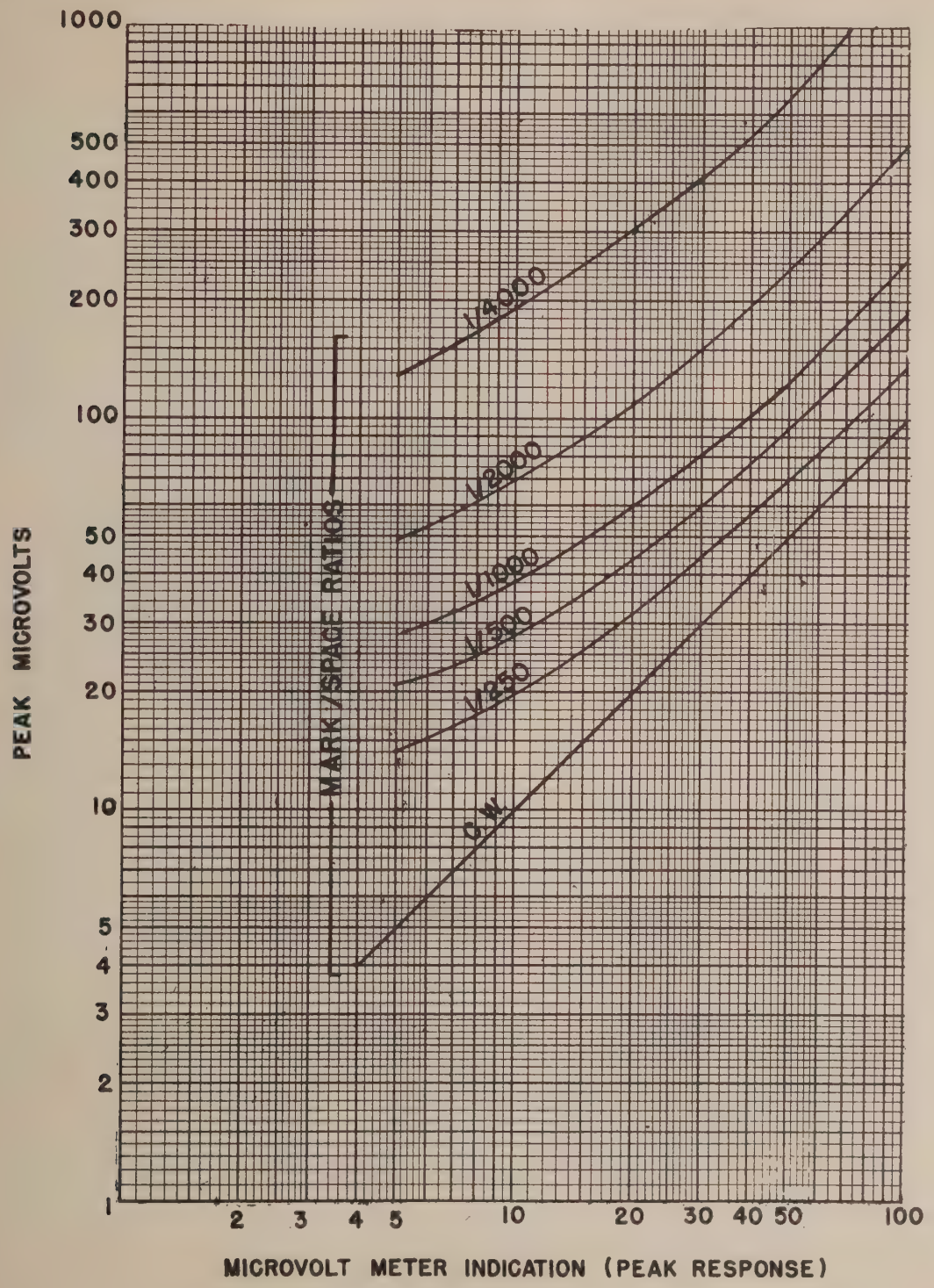


FIGURE 3-6
Mark-space ratio compensation chart

3.61 Microvolts per Meter Computation

3.611 Radio Noise Interference and Pulse Measurements

(1) Where the constants of a pulse or noise voltage are known or can be analyzed compensation for the mark-space ratio can be made as indicated in Figure 3-6. Obtain the mark-space ratio. This ratio is equal to the pulse width or mark time divided by the space width. It is also equal to:

$$\frac{\text{pulse width (sec)}}{\frac{1}{\text{repetition rate (cps)}} - \text{pulse width (sec)}}$$

For continuous or nearly continuous noise the mark-space ratio is unity.

(2) Take the compensated PEAK MICROVOLT reading from Figure 3-6.

(3) Obtain probe factor (where high-impedance probe is used) from Figure 3-7. Omit factor where probe is not used.

(4) Obtain effective height from Figure 3-5.

SEE ERRATA SHEET FRONT SECTION OF MANUAL

(5) Note CALIBRATION multiplier K.

(6) Substitute these values in the following equation:

$$\text{microvolts (peak) per meter} = \frac{\text{K x probe factor x compensated peak microvolts}}{\text{effective height of antenna (meters)}}$$

(See example in subparagraph 3.62 below).

NOTE: In all models the value of K for each band is indicated on the CALIBRATION number scale when the MEGACYCLE pointer is at the high-frequency end of the dial.

3.612 Radio Field Strength Measurements

(1) Obtain probe factor (where high-impedance probe is used) from Figure 3-7. Omit factor where probe is not used.

(2) Obtain effective height from Figure 3-5.

SEE ERRATA SHEET, FRONT SECTION OF MANUAL

(3) Substitute these values in the following equation:

$$\text{microvolts (rms) per meter} = \frac{\text{K x probe factor x average microvolts reading}}{\text{effective height of antenna (meters)}}$$

(See example in subparagraph 3.62 below).

3.613 Power Line Noise Measurements

(1) Obtain the mark-space ratio as shown in subparagraph 3.611.

(2) Take the compensated PEAK MICROVOLT reading from the accompanying graph (Figure 3.6).

(3) Obtain probe factor from Figure 3-7.

(4) Substitute these values in the following equation:

$$\text{microvolts (peak, absolute)} = \text{probe factor x compensated peak microvolts}$$

(See example in subparagraph 3.62 below).

3.614 Attenuation and Voltage Ratio Measurements

$$\text{attenuation factor} = \frac{\text{microvolt input}}{\text{probe factor x average microvolts reading}}$$

$$\text{signal-to-noise ratio} = \frac{\text{microvolt reading on signal}}{\text{microvolt reading detuned}}$$

$$\text{front-to-back ratio} = \frac{\text{microvolt reading for front position}}{\text{microvolt reading for back position}}$$

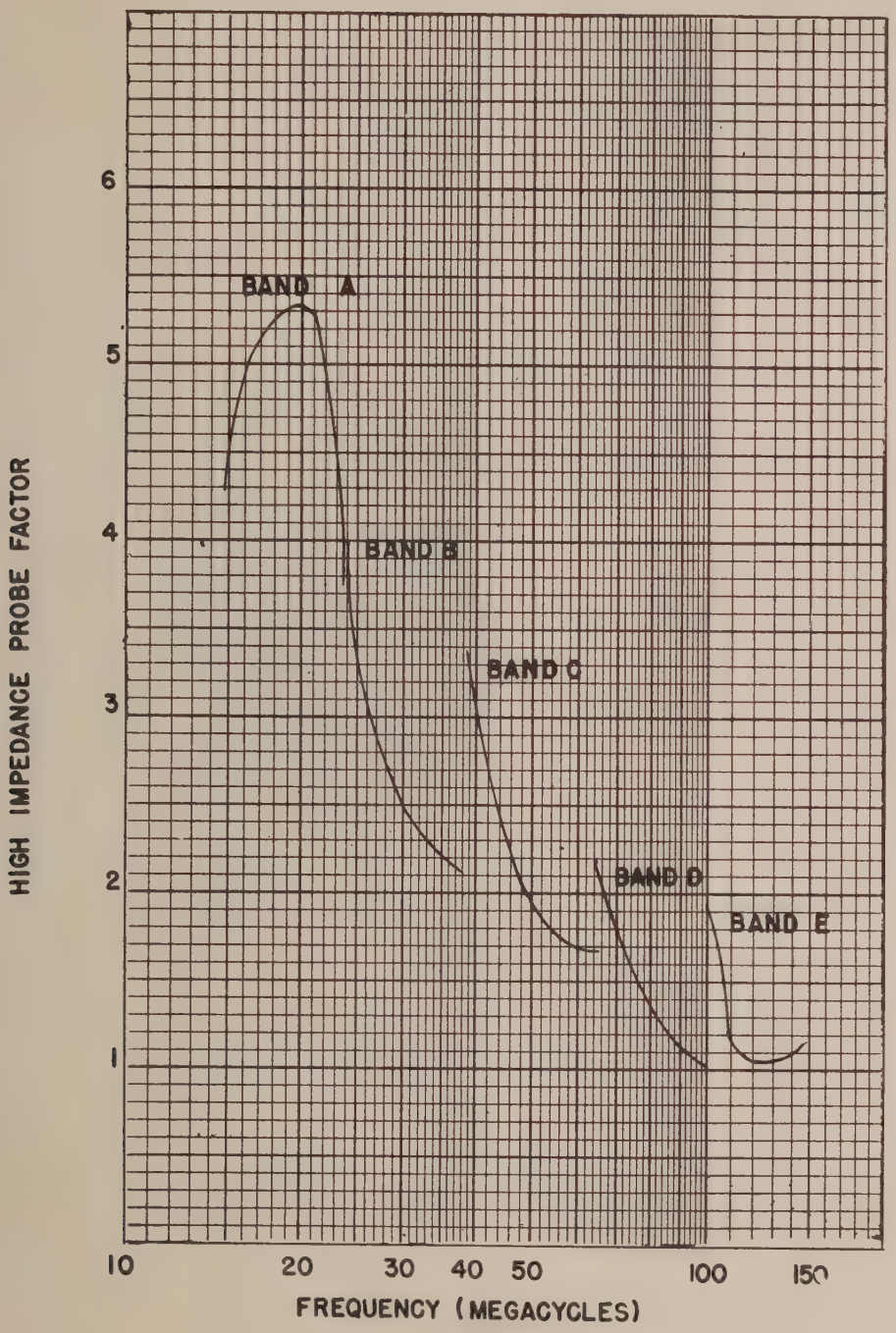


FIGURE 3-7
Probe factor

3.62 Examples

3.621 Radio Noise Interference and Pulse Computation

Measurements taken on a pulse of 5 microseconds with a repetition rate of 100 pulses per second.

Frequency	22 mc
MICROVOLT meter reading (peak)	X100
High impedance probe factor (Figure 3-7)	4.8
Type of antenna used	high-impedance probe and rod
Length of rod	10 inches
Effective height of antenna in meters (Figure 3-5)	0.127
CALIBRATION dial Multiplier K	X1

(1) Obtain mark-space ratio from (known) constants of pulse:

$$\frac{\text{pulse width (sec)}}{\frac{1}{\text{repetition rate (cps)}} - \text{pulse width (sec)}} = \frac{0.000005}{0.01 - 0.000005} = \frac{1}{2000}$$

(2) Obtain compensated PEAK MICROVOLTS reading from Figure 3-6 = 26000.

(3) High impedance probe factor from Figure 3-7 = 4.8

(4) Effective height of antenna = half physical length expressed in meters (inches x 0.0254) = 0.127.

(5) Substitute these values in the following equation:

$$\text{microvolts (peak) per meter} = \frac{\text{K x probe factor x compensated peak microvolts}}{\text{effective height of antenna (meters)}}$$

$$\text{microvolts (peak) per meter} = \frac{1 \times 4.8 \times 26000}{0.127} = 983{,}000$$

3.622 Radio Field Strength Computation

Frequency	90 mc
MICROVOLT meter reading (average)	40
Type of antenna used	doublet
Effective height of antenna in meters (Figure 3-5)	0.52
CALIBRATION dial Multiplier K on D band of CALIBRATION dial	X1

Substitute these values in the following equation:

$$\text{microvolts (average) per meter} = \frac{\text{K x average microvolts}}{\text{effective height of antenna}}$$

$$\text{microvolts (average) per meter} = \frac{1 \times 40}{0.52} = 769$$

In the example below higher sensitivity was desired than that ordinarily obtainable. During calibration (subparagraph 2.51) a calibration number of 20 was used instead of 13 to make measurements of weak signals at 50 mc.

Frequency	50 mc
MICROVOLT meter reading (average)	28
Type of antenna	Doublet
Effective height of antenna in meters (Figure 3-5)	0.95

Substitute these values in the following equation:

$$\text{microvolts (average) per meter} = \frac{\text{K x average microvolts x } \frac{\text{original calibration \#}}{\text{new calibration \#}}}{\text{effective height of antenna}} = \frac{1 \times 28 \times \frac{13}{20}}{0.95} = 19.2$$

SEE ERRATA SHEET, FRONT SECTION OF MANUAL

3.623 Power Line Noise Computation

Measurements taken on a known pulse, 12 microseconds wide, with repetition rate of 40 per second.

Frequency . . . . . 25 mc
MICROVOLT meter reading (peak). 75,000
High-impedance probe factor (Figure 3-7). 1.5

(1) Obtain mark-space ratio:

$$\frac{\text{pulse width (sec)}}{\frac{1}{\text{repetition rate (cps)}} - \text{pulse width (sec)}} = \frac{0.000012}{0.025 - 0.000012} = \frac{1}{2080}$$

(2) Obtain compensated PEAK MICROVOLT reading from Figure 3-6 = 380,000.

(3) High-impedance probe factor from Figure 3-7 = 1.5

(4) Note CALIBRATION number on B band of CALIBRATION dial = X1

(5) Substitute these values in the following equation:

microvolts (peak) absolute = K x probe factor x compensated peak microvolts

microvolts (peak) absolute = 1 x 1.5 x 380,000 = 570,000

(This indication may be inaccurate because of leakage to power supply leads in fields beyond 100,000 microvolts per meter).

3.624 Attenuation Factor Computation

Frequency . . . . . 38 mc
MICROVOLT meter reading (average) 70
High-impedance probe factor (Figure 3-7). 3.35
Microvolts input. 4700
CALIBRATION Multiplier K for B band . . . X1

Substitute these values in the following equation:

$$\text{attenuation} = \frac{\text{microvolts input}}{\text{K x probe factor x average microvolts}}$$

$$\text{attenuation} = \frac{4700}{1 \times 3.35 \times 70} = 20$$

3.625 Signal-to-Noise Ratio or Front-to-Back Ratio Computation

$$\frac{\text{microvolt reading (average) on signal}}{\text{microvolt reading (average) detuned}} = \frac{8000}{10} = 800$$

3.626 R-F Voltage Computation

Frequency . . . . . 72 mc
MICROVOLT meter reading (average) 11,300
High-impedance probe factor (Figure 3-7). 1.8
CALIBRATION dial multiplier K on D band
of CALIBRATION dial X1

r-f voltage = K x probe factor x microvolt reading (average) x 10^{-6} = 1 x 1.8 x 11300 x 10^{-6} = 0.0203 volts

SEE ERRATA SHEET, FRONT
SECTION I - MANUAL

SECTION IV

THEORY

4.0 GENERAL

Measuring an r-f signal or noise voltage in space involves intercepting the voltage with a collector or antenna, amplifying that voltage (in a receiver) and converting it to an indication on the scale of a meter. To impart accuracy to the measurement, a standard for comparison must be included. The essential elements of such a device are pictured in Figure 1-2. The measurement of r-f voltage is accomplished by first calibrating the receiver against the standard, recording the meter reading, and computing the result from the known constants of the system.

4.1 ANTENNAS

Electromagnetic waves as defined by Maxwell's equations can be broken up into two separate fields: the induction field, and the radiation field. Both of these fields are present near the source with the induction field the predominant one. At any appreciable distance (large compared to wave length) the radiation field predominates, since the induction field decreases more rapidly with distance than the radiation field.

In the field about a radiating antenna in free space, the radiation field just equals the induction field at a distance of $\lambda/2\pi$ from the radiator as can be seen from the following formula taken from the Bureau of Standards Scientific Paper 354, page 452.

$$H = \frac{2\pi hI}{10\lambda d} + j\frac{hI}{10d^2}$$

Where the first term is the radiation field, while the second term is the induction field..."h" is the effective height of the antenna; "I" is the current in the antenna; "λ" is the wave-length; "d" is the distance from the radiator; and "H" is the total magnetic field. It will be noted that the operator "j", as usual, means that the two terms are 90° out of phase.

It is quite evident that the radiation term varies inversely as the first power of the distance, while the induction term varies inversely as the square of the distance. When the distance is less than $\lambda/2\pi$, it is evident that the principle component of the magnetic field is that contributed by the second term, the induction field. Therefore, at the ultra high frequencies, where the circuit dimensions are at least comparable to $\lambda/2\pi$, the radiation field is more important than it would be at the lower frequencies. This might be stated another way by saying that it is frequently desirable to measure the field strength near a source, but at the ultra high frequencies it is more likely to be the radiated field and not the induction field which is measured.

The magnetic component will be measured when using the loop antenna provided for use with the Model 58. The half-wave doublet will respond to the electric component of the field which is not directly related to magnetic component discussed above except at distances large compared to wavelength. Therefore it is only possible to correlate accurately readings of the two types of antenna systems when measuring pure radiation fields.

Complicated radiation systems do not lend themselves well to precise analysis of the relation between the magnetic and electric fields at distances short compared to wavelength. However, if the distance of the antenna to source is held constant and the frequency of measurement changed, the results obtained must be carefully considered. This is because at lower frequencies, a field is being measured which drops off rapidly with the distance, while at the higher frequencies a field is being measured which decreases more slowly with distance.

The so-called "effective height" is therefore only significant in a pure radiation field. For the case of the one half wave doublet antenna, the effective height (h) is defined as the distance in

meters between the effective current centers. (It is not to be confused with the electrical length which is a ratio of the length of the antenna to the wave length.) The effective height of a half-wave doublet, as mentioned in paragraph 3.2, can be calculated from the formula $h = \frac{\lambda}{\pi}$ where λ is the wave length in meters.

The half-wave doublet antenna responds to the electric vector and will yield a maximum when its direction is parallel with the direction of the electric vector component. This direction is always at right angles to the direction of propagation.

For the loop type antenna the effective height in meters can be calculated from the formula $h = \frac{2\pi nA}{\lambda}$, where n is the number of turns in the loop (one for the Model 58), A is the area of the loop in square meters, and λ is the wave length in meters. The loop antenna response is a maximum when the plane of the loop is parallel to the direction of wave travel (or current flow) and at right angles to the magnetic vector component. Therefore the direction of the current flow can be easily determined with the loop probe antenna, and because of its directional properties, the loop probe will be found more useful for locating leaks in ignition shielding than the capacity probe antenna.

The loop probe is shielded electrostatically and balanced to ground so that it does not respond to the electrostatic component of an induction field. It has been found that the magnetic field is just as good a measure as the electrostatic for most work. As pointed out above, the two components are equivalent and bear a fixed relation to one another in a pure radiation field in free space. Shielding frequently eliminates the electrostatic component of an induction field but does not reduce the magnetic component in the same proportion due to the nature of the shielding employed; therefore, the loop probe may be at an advantage in these cases in locating leakage.

Experimental factors enter into the determination of loop effective height data. As mentioned in paragraph 3.2 in the case of the untuned loop, it is necessary to take into account the loss due to reflection.

4.2 CALIBRATION

Calibration can be accomplished by applying a voltage of known magnitude to the input terminals of the amplifier and adjusting the receiver gain until the output meter reads a particular value. Such a known voltage can be supplied by a standard signal generator covering the ultra high frequency range; however, such a signal generator is cumbersome and awkward to use for this purpose, since it involves a well shielded oscillator with means for switching coil ranges and a calibrated frequency dial together with an attenuator system for reducing the oscillator output to some small accurately known value. Such a calibration involves several rather tedious operations by the user, and it was the thought of saving time as well as space and weight which prompted a search for other less complicated methods.

One convenient source frequency used in the past for calibration has been thermal noise existing in the first tuned circuit of the receiver itself.[1] Unfortunately the amount of thermal noise present across the receiver input circuit in the ultra high frequency range is very small, because the tuned circuit impedance to which the noise is proportional is usually quite small. Thermal noise has the desirable characteristic that it is uniformly distributed over a wide frequency range, and therefore requires no tuning of the receiver to any particular frequency as is required of the signal generator method of calibration.

There is another source of noise which has a sound very much like thermal noise and is often confused with it. This noise is called shot noise. It has been pointed out in the literature[2] that pure shot noise exists in the absence of space charge in the vacuum tube; the space charge smoothes out the fluctuations to a great extent. It is possible to eliminate space charge by lowering the filament temperature until the plate is attracting all of the electrons from the cathode as fast as

(1)"Thermal Agitation of Electricity in Conductors" by J.B. Johnson, Physical Review, Volume 32, July 1928, pages 97 - 109.
(2)"Fluctuation Noise in Radio Receivers" by Stuart Ballantine, Journal of the Franklin Institute, Vol. 206, page 159, 1928.

they are emitted. Under these conditions the plate current is not dependent upon plate voltage but upon filament temperature (if the plate voltage is above a certain minimum value, of course), and it has been found that the shot-noise component of plate current is proportional to the d-c plate current flowing.(1)(2)

Shot noise is a suitable means for calibration: it requires no extra tuning controls because it has a uniform frequency distribution; it has a much greater amplitude than thermal agitation noise; and this amplitude can be readily adjusted to some prescribed value by only a d-c milliammeter.

Like thermal noise this shot noise builds up a voltage across the receiver first tuned circuit proportional to the impedance of the circuit. It is necessary to take into account the band-width of the receiver, the step-up of the antenna coil, the loss in the transmission line from the antenna to the receiver, and the effective height of the antenna.

Satisfactory shot-noise diodes are preferably constructed using pure tungsten filaments. Early Model 58's used the type 958 tube as a shot-noise diode with plate and grid tied together. Due to the unstable emission characteristic of its coated type filament, more recent Model 58's have employed the Zenith type M74 hearing aid pentode connected as a diode. At the present time experimental diodes have been obtained with pure tungsten filaments and other necessary characteristics well suited to application in the Model 58.

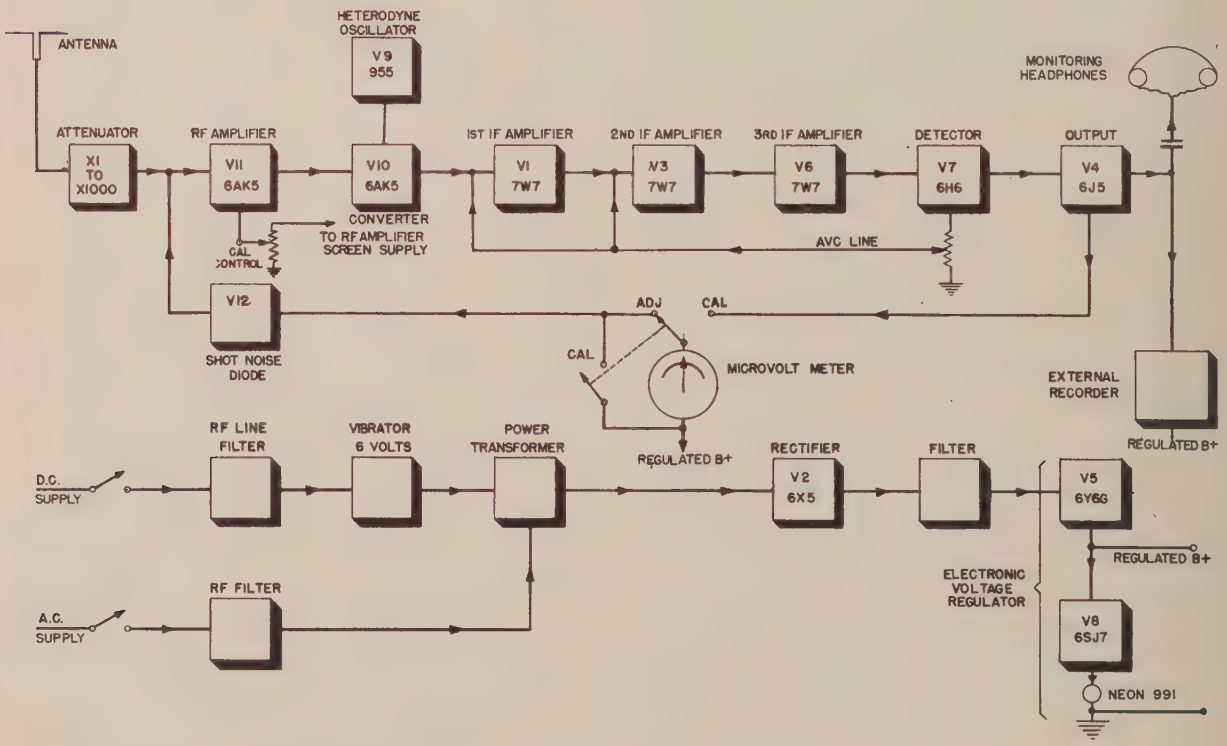


FIGURE 4-1
Model 58 functional block diagram

(1)"Thermal Agitation of Electricity in Conductors" by J.B. Johnson, Physical Review, Volume 32, July 1928, pages 97 - 109.
(2)"Fluctuation Noise in Radio Receivers" by Stuart Ballantine, Journal of the Franklin Institute, Vol. 206, page 159, 1928.

4.3 MODEL 58 UHF RADIO NOISE AND FIELD STRENGTH METER

4.30 General

The Model 58 receiver (Figures 1-1, 1-2) is actually a laboratory type superheterodyne designed for the reception of continuous wave, intermittent or modulated continuous wave signals either amplitude or frequency modulated in the range from 15 to 150 megacycles. The receiver provides a balanced input attenuator, a shot-noise calibrator or standard signal level source, and a special output stage from which the signal strength is indicated on a five-milliampere meter calibrated in microvolts. The output circuit also permits monitoring of the signal with headphones, an oscillosocope, and/or a graphic recorder. The characteristics of the receiver are given in paragraph 1.2.

4.31 Function

The receiver detects and amplifies the minute signals fed to it from the antenna input and converts these signals to calibrated indications on the MICROVOLT meter, the graphic recorder, oscilloscope, or headphones (Figure 4-1).

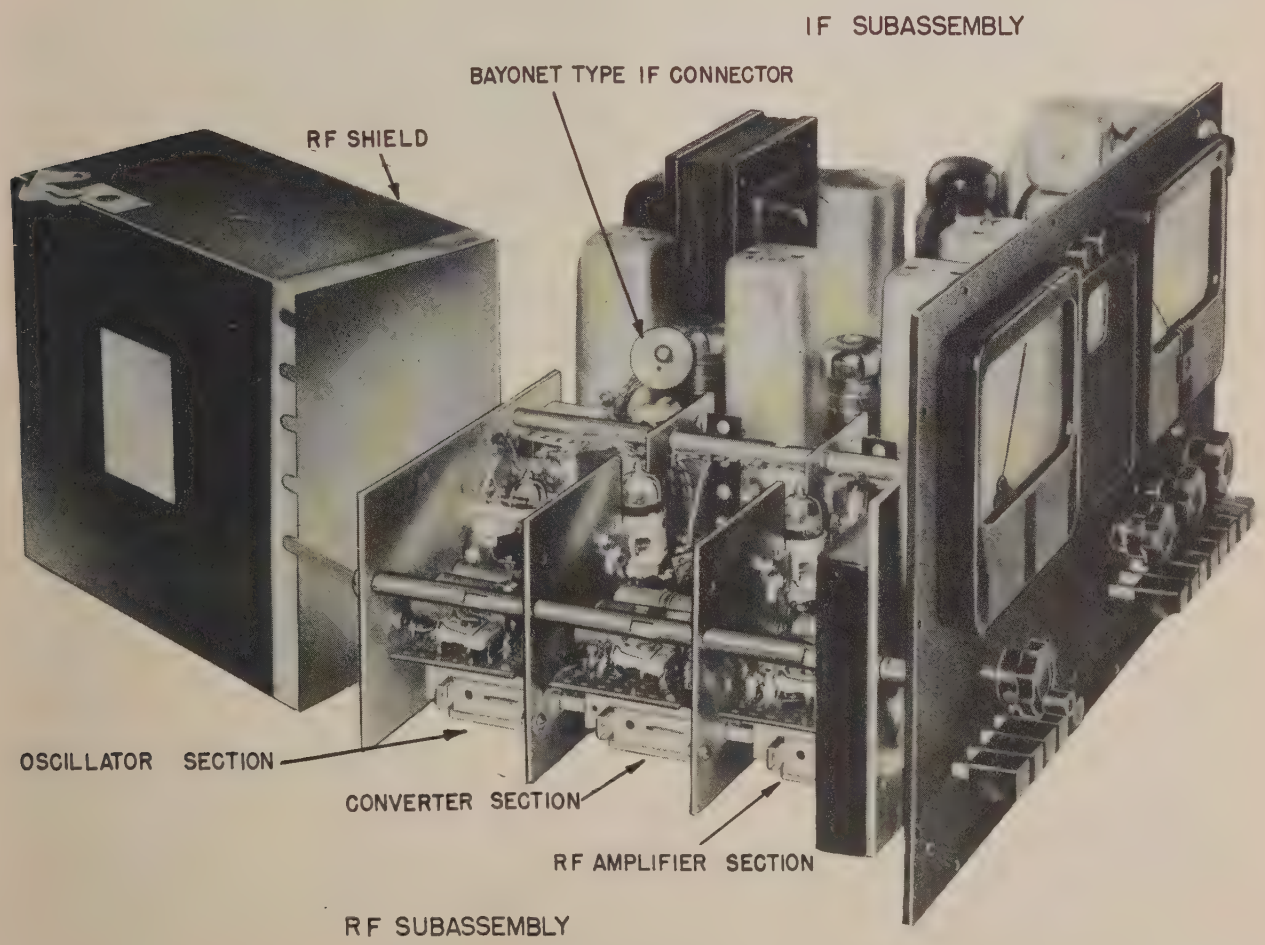


FIGURE 4-2
Model 58 removed from case

4.32 Physical Description

4.320 General

The Model 58 (Figure 4-2) is housed in a case 15-11/16 by 9-3/8 by 8-3/4 inches overall. Four subsections comprise the receiver:

(1) The control panel;

(2) The r-f amplifier, converter, and oscillator assembly;

(3) The i-f, output and power supply assembly;

(4) The attenuator.

4.321 Control Panel

Controls, receptacles, nameplates, dial scales and the meter are mounted on an aluminum panel 15-11/16 by 8-3/4 by 1/8 inches (Figure 2-4), securely fastened to the rest of the instrument. The front of the panel is finished in black wrinkle enamel. Operation and adjustment of the Model 58 is accomplished by four control knobs, two groups of push buttons and a PEAK-AVERAGE switch. Connections to the instrument are made to four receptacles. Three of these, the ANTENNA receptacle, the six-prong male power input connector, and the PHONES jack, are in vertical alignment on the right of the panel; the fourth, a pair of self-shorting type RECORDER tip jack terminals is centered on the upper part of the panel above the instrument nameplate. To the left of this nameplate is the frequency calibrated, direct reading five-band MEGACYCLE scale. Its black pointer is operated by a tuning knob mounted directly below. Underneath the tuning knob are the five band-selecting push buttons. Each button is engraved with its band letter and frequency range. The five-band CALIBRATION scale appears behind a window above the instrument nameplate. The letters A to E etched on the window correspond with the five letters on the band selecting push buttons. The frequency tuning knob rotates this scale. To the right of the CALIBRATION scale is the 0 - 100 MICROVOLT meter enclosed in a rectangular dust proof cover identical to that covering the MEGACYCLE scale. Three control knobs under the MICROVOLT meter, ZERO, CAL, and ADJ, are for use in adjusting and calibrating the instrument before measurements are taken. The PEAK-AVERAGE switch is situated between these controls and the MICROVOLT meter, and permits peak or average meter indications. The group of eight push buttons mounted beneath these adjustment controls comprises the operation switch. Four buttons are for the attenuator decade, three for adjustment, and one is the OFF button. Arrows on an adjacent WARNING plate direct attention to the need for limited use of the CAL and ADJ push buttons.

4.322 R-F Amplifier, Converter, and Oscillator Subassemblies

The r-f amplifier, converter, and oscillator coil assemblies with their associated components (Figure 4-2) are housed in a copper shield. This assembly is divided into three sections, by stages, individually shielded from each other by aluminum plates. The assembly includes the dial drive mechanism and is secured to the left side of the front panel. A shielded single bayonet-type connector feeds the i-f signal to the i-f subassembly. Five insulated wires terminating in a six-prong plug connect supply voltages from the rest of the receiver.

From the front panel, there follow in order toward the rear of the assembly the dial drive mechanism, the r-f amplifier and the shot-noise diode circuits; the converter, and the oscillator systems (Figure 4-2). Adjustable ceramic mica trimmers (bands B, C, D and E) for the r-f, converter, and oscillator are on the underchassis (Figure 4-3), each group under its respective shielded coil assembly. Mounted adjacent to and above the coil shelves, each in its respective compartment, are the A band adjustable ceramic mica trimmers for the r-f, converter, and oscillator tank circuits. Each group of coils is arranged in order to correspond with the five bands, A to E, with the coils for the highest-frequency band (E band) closest to the tuning capacitor. The A, B, and C band tank coils and coupling links covering the frequency range from 15 to 62 mc, are closely wound on wax impregnated paper tubes. The D and E band coils (60 to 150 mc) are wound without forms and their end connections are soldered directly to the silver switch contacts. The respective grid coils and links are interwound.

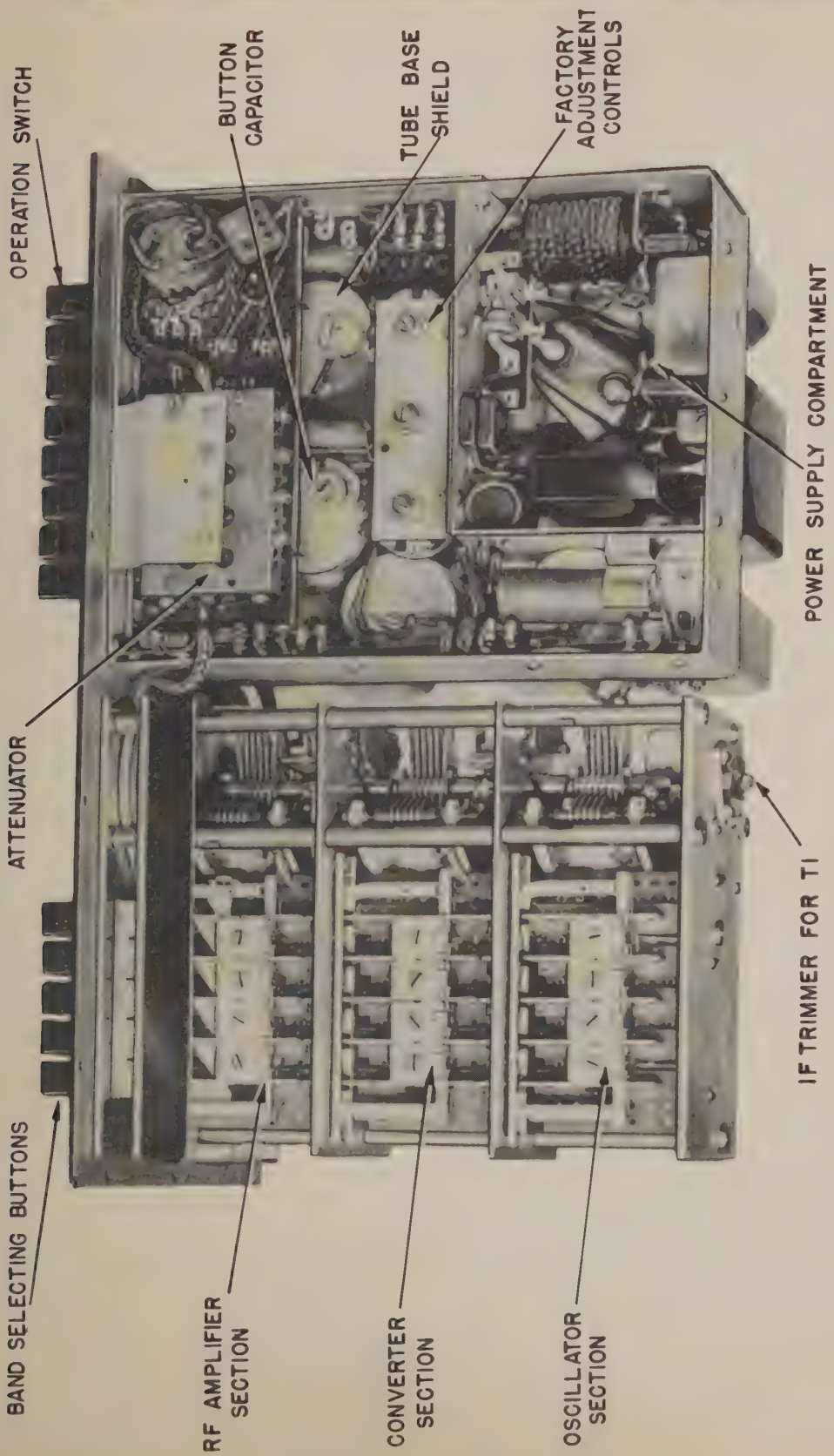


FIGURE 4-3
Model 58 Under-chassis view

Each band is selected by the lettered frequency range push buttons on the left front of the panel underneath the tuning knob (Figure 5-4). The three-ganged capacitor which tunes the antenna, converter and oscillator tank circuits is operated by a gear-driven mechanism. This mechanism is coupled to the calibration scale by a dial cord and pulley arrangement (Figure 5-5), for simultaneous operation of frequency selection and calibration. The driving shaft carries a vernier tuning knob equipped with a small crank extension for rapid traverse of the frequency ranges. Approximately fifteen turns of the vernier tuning knob are required to cover each of the five direct-reading scales corresponding to the five frequency bands.

4.323 I-F, Output, and Power Supply Subassemblies

An aluminum chassis secured to the rear right side of the front panel, supports and houses the i-f, output, and power supply subassembly (Figure 4-2). Comprising the i-f unit are three i-f tubes and four aluminum shielded i-f transformers. The resistors for the various i-f circuits are mounted on bakelite terminal boards on the underchassis. On the underchassis (Figure 4-3), also, the detector and each i-f tube socket is fully enclosed in a specially constructed cylindrical shield can with removable cover. Button type mica capacitors serve the dual purpose of by-pass and feed-through for the connections to the insides of the tube socket shield cans.

A 6J5 output tube is located next to the power transformer. Two regulator tubes, a 6Y6G and a 6SJ7GT/G, a 6X5 full-wave rectifier, a 991 neon-tube regulator, a filter capacitor, a vibrator, and the power transformer complete the complement of units mounted directly on the aluminum chassis. Underneath this chassis and enclosed separately within a shielded compartment are the vibrator and power supply filter components and wiring. Three controls for initial factory adjustments are mounted on an aluminum bracket located approximately in the center of the i-f and power supply underchassis (Figure 4-3). These controls are marked, respectively, GAIN, AVC, and B PLUS.

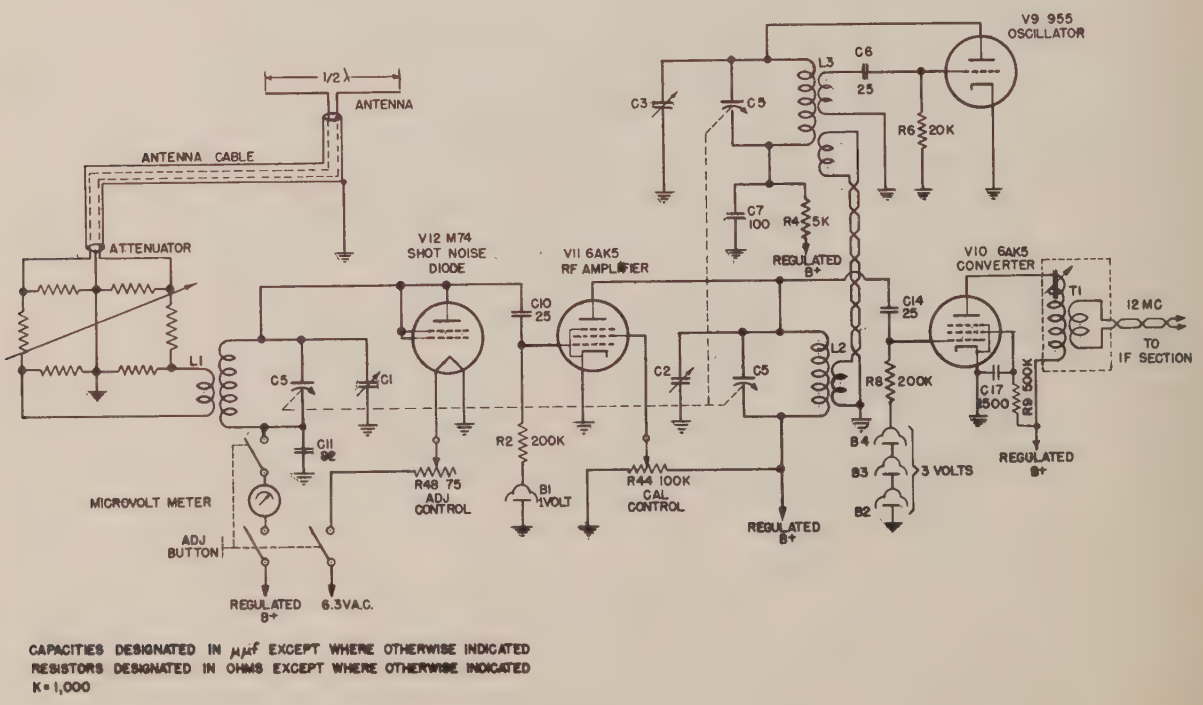


FIGURE 4-4
R-f circuit functional diagram

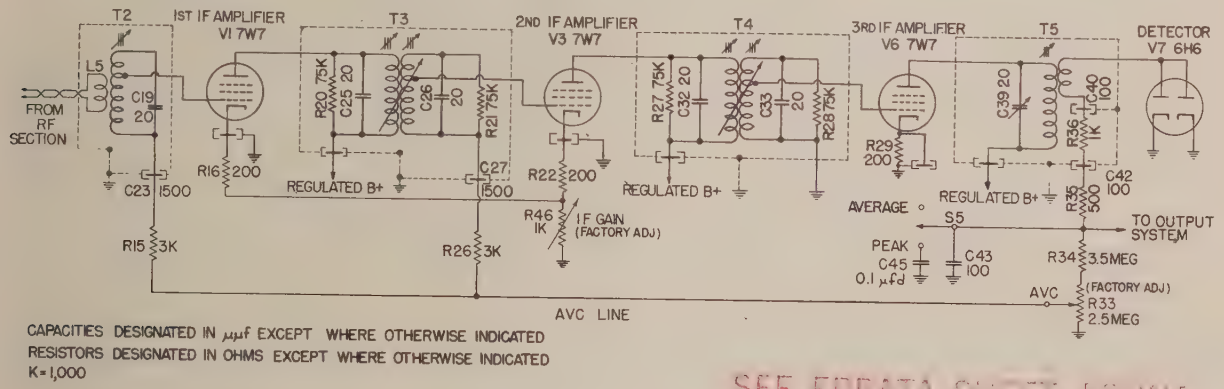
4.324 Input Attenuator Subassembly

Two matched metal pieces enclose the four decade unit to form a shielded attenuator block (Figure 4-3) which, together with the push-button switching arrangement, is mounted at the front end of the i-f subassembly. Two leads of a shielded twisted conductor terminating at the antenna subassembly compartment are soldered to a terminal strip on the attenuator block. On the side opposite the terminal strip the shield of the twisted antenna input conductor is soldered. A thin silver-plated strap connects the attenuator assembly to the chassis. This strap is connected to the attenuator on one end by four screws and is clamped between the chassis and front panel on the other end. Four lettered push buttons (marked X1, X10, X100, X1000) on the front panel (Figure 5-4) corresponding with the four decade units, actuate the switch mechanism which governs the choice of attenuator decade. This switch has four additional positions. One is an OFF button and the other three switch the circuits for the calibrating and adjusting operations.

4.33 Electrical Circuits

4.331 Attenuator

The attenuator (Figure 4-3) consists of fourteen carbon composition type resistors, of values shown in Figure 6-3, connected in a balanced-to-ground ladder network. Four sections of the operations switch select proper combinations of these resistors to provide attenuation steps of X1, X10, X100 and X1000. The terminal resistance for each of these steps remains constant at 72 ohms (subparagraph 5.23).



SEE ERRATA SHEET FOUND IN SECTION VI

FIGURE 4-5
I-f circuit functional diagram

4.332 R-F Circuits

The signals from the attenuator are selected and tuned by the five-band, r-f amplifier stage (Figure 4-4). A push-button type switch selects the proper coil for the required band. The r-f stage employs a type 6AK5 tube (V11).* The CAL control (R44) adjusts the screen voltage of this tube and thereby sets the gain of the receiver. Bias is fixed by a one-volt bias cell.

A separate oscillator tube (V9) and converter (V10) are used to convert the antenna signal to twelve megacycles for further amplification in the i-f stages. The oscillator tunes twelve megacycles above the r-f frequency, except on the E band where it tunes twelve megacycles below the signal frequency.

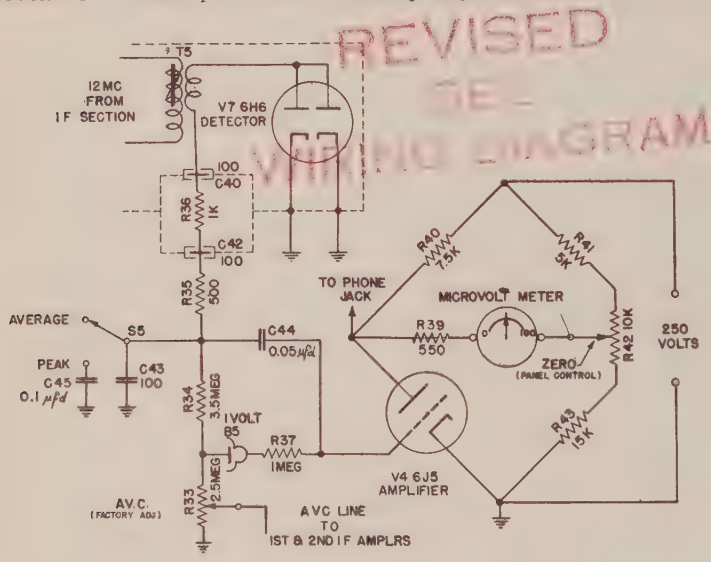
The oscillator uses a grid tickler feedback circuit with the tuned tank (L3) in the plate circuit. A link winding couples the oscillator energy to the converter. The combination of r-f and oscillator energy in the converter results in a twelve-megacycle signal which is fed to the i-f amplifier.

*Sets with serial numbers below 185 employ type 956 r-f, a type 954 oscillator, and type 6SK7 i-f tubes.

4.333 I-F Circuits

Three i-f amplifier stages (Figure 4-5) employing loktal type 7W7* tubes are used in the Model 58. Two permeability tuned circuits (T1, T2)** link connected are employed to couple the converter tube (V10) to the first i-f tube (V1). One of these transformers (T1) is in the plate circuit of the converter and is located in the r-f assembly. The other transformer (T2) is in the grid circuit of the first i-f tube and is located in the i-f assembly. The two are connected by a link circuit. The primaries and secondaries of the interstage i-f transformers are loaded with 75,000-ohm resistances to provide 150-kc pass band width. The secondary of the output i-f transformer (T5) is untuned and feeds a type 6H6 dual-diode detector (V7) with the diodes connected in parallel. R-f and i-f voltages are removed from the detector output by suitable choice of filter constants with a minimum attenuation of the high-frequency modulation components.

A 1,000-ohm variable resistor (R46) connected in the cathode returns of the first and second i-f tubes provides a factory adjustment for i-f gain. A 2.5-megohm potentiometer (AVC, R33) in the diode detector return circuit provides another factory adjustment for automatic volume control. The semi-logarithmic scale of the MICROVOLT meter is obtained by careful adjustment of these controls as described in paragraph 4.6.



CAPACITIES DESIGNATED IN μμf EXCEPT WHERE OTHERWISE INDICATED
RESISTORS DESIGNATED IN OHMS EXCEPT WHERE OTHERWISE INDICATED
K = 1,000

FIGURE 4-6
Output and metering circuits functional diagram

4.334 Metering and Monitoring Circuits

The output of the detector feeds a type 6J5 amplifier tube (V4) connected in a bridge circuit (Figure 4-6). Signals fed to the 6J5 alter the plate-to-cathode resistance, in proportion to the signal strength, and upset the balance of the bridge. Any change in the balance of the bridge will cause a proportional indication on the meter. A two-position toggle switch (PEAK-AVERAGE, S5) in the input circuit to the 6J5 connects a 0.1-μf capacitor (C45) across the circuit to obtain PEAK indications. C45 is disconnected for AVERAGE indications.

A one-volt bias cell (B5) in series with the automatic volume control voltage provides initial bias for the 6J5 tube. A 10,000-ohm potentiometer (R42) in the bridge circuit permits initial ZERO adjustment of the meter. The PHONES and RECORDER connections are in the plate circuits of the 6J5 tube. The use of high-impedance phones and/or the recorder in no way influences the accuracy of the measurements.

Fidelity is maintained in the detector and output circuits such that the frequency response characteristic does not deviate by more than 2 db from its 1000-cycle value in the range from 100 to 5,000 cps, in accordance with RMA standards.

Noise and interference voltages are measured with the PEAK-AVERAGE toggle switch in the position marked PEAK. Time constants chosen for the circuit elements involved in the detector stage allow for fast charge (approximately 1 millisecond) and slow discharge (600 milliseconds) in accordance

*Sets with serial numbers below 185 employ type 956 r-f, a type 954 oscillator, and type 6SK7 i-f tubes.
**Sets with serial numbers below 310 employed capacitively tuned circuits.

with RMA standards. Indications on the MICROVOLT meter are in peak microvolts equivalent to sine wave microvoltage passed through the same circuits and giving the same meter deflection.

By rectifying the output and applying some automatic volume control to the first and second i-f amplifier tubes (V1, V3) a semilogarithmic output scale has been obtained to permit accurate reading of signal or noise magnitudes which vary over a wide range. The output meter is calibrated from 0 to 100 microvolts in terms of the signal applied to the transmission line through a split 72-ohm dummy antenna.

4.335 Power Supply Circuits

The Model 58 employs internal power supply components which deliver heater current and regulated, filtered plate current for all the tube circuits of the instrument, from either a six-volt, d-c source or from a 105- to 125-volt, 50 to 60 cycles, single phase a-c source. Approximately 70 watts are required from either source.

The same power transformer (T6) is used in either mode of operation (Figure 4-7). A jumper between pins 8 and 10 on the 117-volt a-c connector interconnects the 6.3-volt winding to the

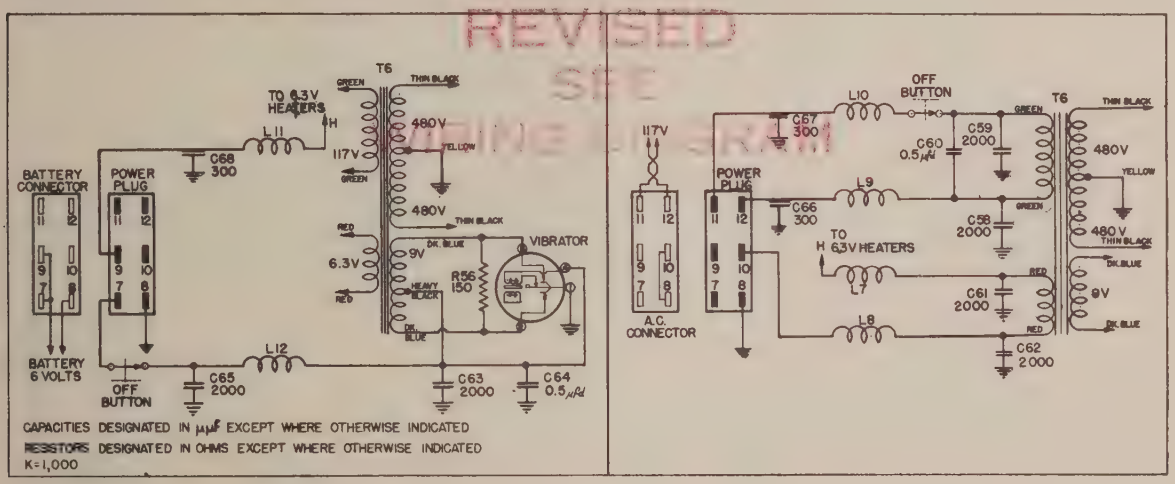


FIGURE 4-7
Power input functional diagram

heaters during a-c operation. Similarly, for d-c operation a jumper between pins 9 and 7 connects the battery voltage to the heaters. A special winding on the transformer receives interrupted d-c from a nonsynchronous type vibrator during d-c operation. The vibrator is not operative when the Model 58 is connected to an a-c source. During a-c operation input power is supplied to a 117-volt primary winding. The use of r-f chokes and special capacitors assures thorough filtering of the input circuits to minimize surge voltages and r-f interference.

The OFF button disconnects the a-c input when depressed; however, the heaters remain connected to the battery for standby operation when the battery cable is in use. The battery drain is reduced from 12 to 4 amperes by this operation.

A 6X5GT/G full-wave rectifier tube (V2) converts the high voltage from the power transformer (T6) to the d-c required for the plate and screen circuits of the instrument (Figure 4-8). A filter and a vacuum tube regulator circuit smooth fluctuations and regulate the rectifier output.

The regulator employs a 6Y6G tube (V5) to control variations in the plate current supply. Differential variations in the plate voltage are amplified by a 6SJ7 tube (V6) to changes in the bias of the 6Y6G. This alters the drop across the 6Y6G tube to compensate for the voltage variation. A type 991 neon tube maintains a constant reference bias for the 6SJ7. A 10,000-ohm potentiometer (R50) in the voltage divider circuit provides a means for factory setting of the B+ voltage at 250 volts.

REVISED
SEE
WIRING DIAGRAM

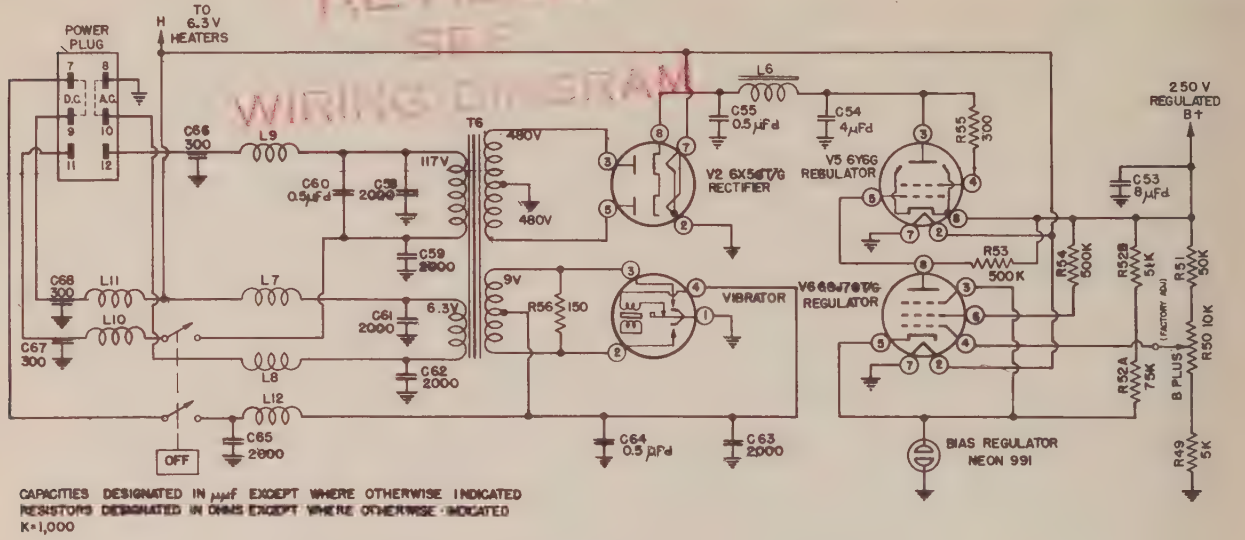


FIGURE 4-8
Power supply circuit functional diagram

4.4 HIGH-IMPEDANCE PROBE

4.41 Function

The high-impedance probe (Figures 4-9, 4-10) is a tunable transformer used in coupling the Model 58 to an external circuit or antenna for measuring r-f voltages, transmission loss of various four-terminal networks, and for determining interference level on power lines, battery leads and the like. It is also useful in adapting special antennas (Figure 4-11) to the Model 58.

4.42 Electrical Circuits

The r-f voltage from the external circuit under investigation is coupled to the probe by a 1.0 µµf capacitor (Figure 4-10). This small value is chosen to permit connection to the circuits with minimum disturbance. Five r-f transformers are provided, one for each of the five ranges of the

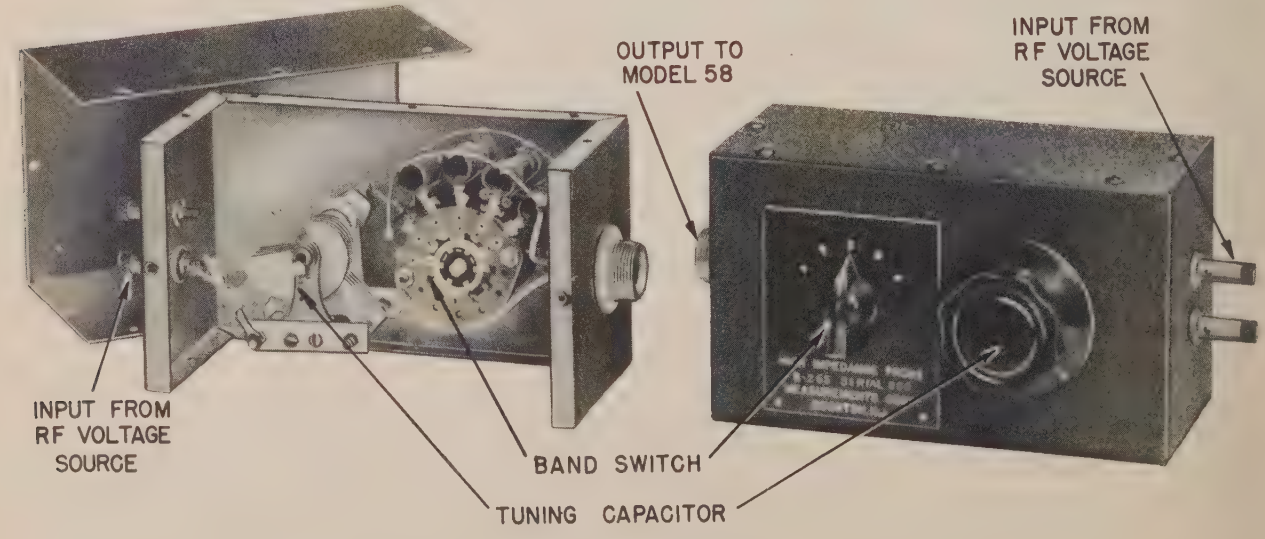


FIGURE 4-9
High Impedance Probe

Model 58. A two-circuit rotary switch connects the proper coil to the circuit and a variable capacitor tunes the primary to resonance.

The attenuation factor introduced by the use of the probe is plotted in Figure 3-7. It is advisable to standardize the Model 58 together with its individual probe (Subparagraph 5.91). Probes with serial numbers above 311 are individually standardized and are provided with individual attenuation charts. Such charts should be used instead of Figure 3-7, where they ar supplied.

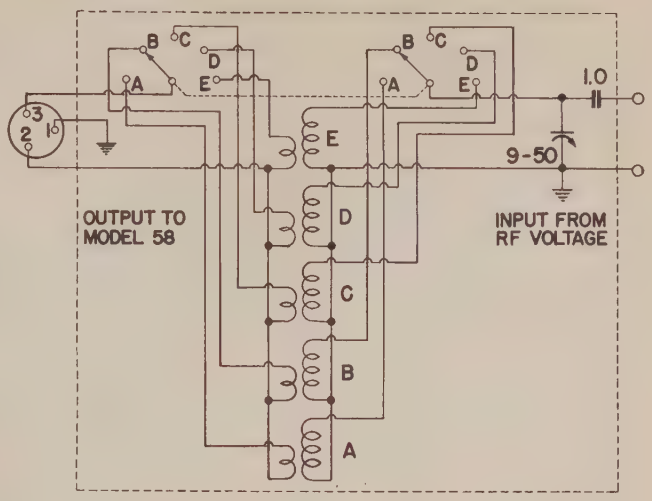


FIGURE 4-10
High-impedance probe circuit diagram

4.5 PANEL CONTROLS AND THEIR FUNCTIONS (Figure 2-4)

4.51 ADJ Knob and ADJ Push Button

The ADJ Knob and ADJ push button represent the controls for setting the MICROVOLT meter pointer opposite the region marked ADJUST, on the extreme right of the meter. This operation applies plate and filament voltages to the shot-noise diode (V12), at the same time connecting the MICROVOLT meter in series with the plate supply, to V12. Adjustment of the filament rheostat (R48) marked ADJ, until the MICROVOLT meter pointer lies within the ADJUST segment, will adjust the plate current of V12 to a standard value by controlling its filament temperature. This establishes a standardized reference level of shot noise across the receiver's first tuned circuit.

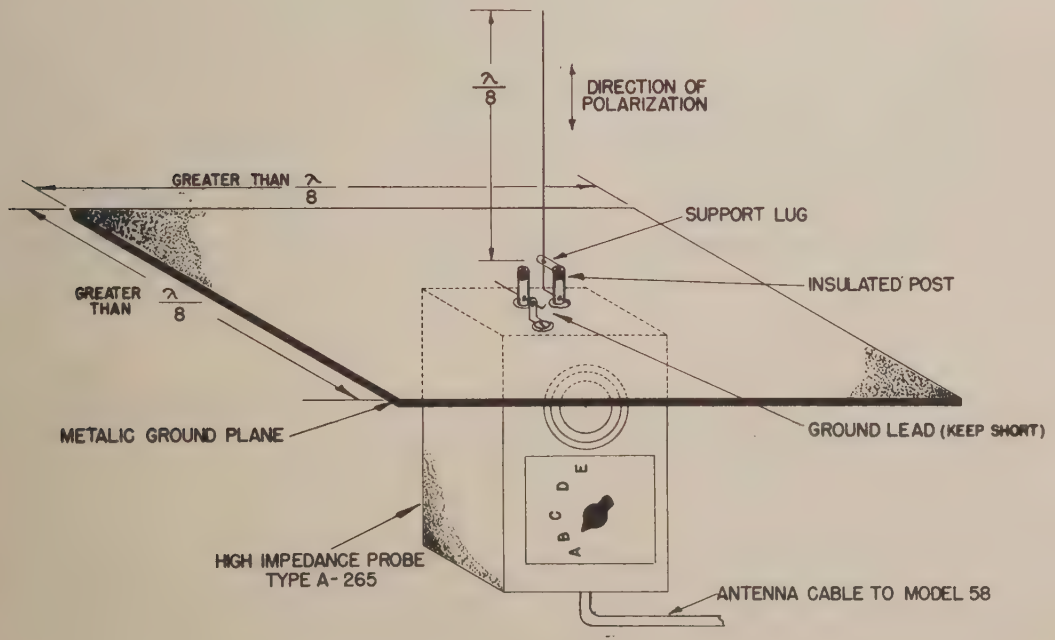


FIGURE 4-11
High-impedance probe and short rod antenna

4.52 CAL Knob and CAL Push Button

The CAL knob and CAL push button represent the controls for setting the MICROVOLT meter pointer to the calibration number indicated by the dial in the center of the instrument panel marked CALIBRATION. This operation calibrates the sensitivity or gain of the receiver by regulating the screen grid voltage of the r-f amplifier tube (V11).

4.53 ZERO Knob and ZERO Push Button

The ZERO knob and ZERO push button represent the controls for setting the MICROVOLT meter pointer to zero position. This operation grounds the attenuator input and balances out various noise responses in the output bridge circuit so that the MICROVOLT meter reads zero.

4.54 Four Decade Push Buttons

Four decade push buttons (X1 to X1000) select the proper attenuator step which reduces the input signal to extend the range of the instrument.

4.55 Vernier Tuning Knob and Frequency Range Push Buttons

The vernier tuning knob controls the tuning of the input and converter stages to the signal and setting of the MEGACYCLE pointer across the five direct-reading scales corresponding to the five frequency bands. A small crank extension and spinner on the tuning knob facilitate rapid traverse of frequency settings. Frequency range is selected by one of the five frequency range buttons underneath the tuning knob. This connects the proper coils in the r-f, oscillator and converter circuits.

4.56 OFF Push Button

In the depressed position, the power to the instrument is turned off and any indications on the MICROVOLT meter fall to zero. Tube filaments remain heated for standby operation when the instrument is battery-operated.

4.6 OTHER CONTROLS AND THEIR FUNCTIONS (Figure 4-3)

NOTE: See Section V for adjustments.

4.61 GAIN Control

This is a factory control which sets the gain of the i-f amplifier. The control is screwdriver-adjusted and is located on the underchassis on a bracket attached to the power supply compartment shield. It is a 1,000-ohm rheostat connected in the cathode return of the first and second i-f amplifier tubes.

4.62 AVC Control

This is a factory control which sets the amount of rectified signal applied as automatic volume control to the grid returns of the first and second i-f amplifier tubes (V1, V3). The control is screwdriver-adjusted and is located on the same bracket with the GAIN control.

4.63 B PLUS Control

This is a factory control which sets the initial grid bias of the voltage regulator tube (V8) which yields regulated 250 volts B+. The control is screwdriver-adjusted and is located on the same bracket with the GAIN and AVC controls. It is a 10,000-ohm potentiometer connected in the regulator voltage divider circuit.

SECTION V

MAINTENANCE

5.0 GENERAL INSTRUCTIONS

5.01 Failure Reports Notification

Apply the maintenance instructions in this section only when return of the instrument is not feasible. In the event of failure of any of the functions of the Model 58 UHF Radio Noise and Field Strength Meter, notify the MEASUREMENTS CORPORATION at once. Many adjustments require special calibrating equipment and facilities which are often lacking in the field. Correspondence with the MEASUREMENTS CORPORATION in many instances will offer practical solutions to difficulties thus saving the time and handling involved in returning the instrument to the factory. In submitting failure reports include information on the available test equipment along with a careful analysis and description of the failure, the model and serial numbers, location, date, and service conditions. Returned instruments will receive prompt attention, including complete performance tests and recalibration, if necessary.

5.02 Packing for Return Shipment

Use the original packing case when possible, since it provides shock protection on all sides of the instrument. If a substitute packing case is used, line the case, particularly the bottom and top, with sufficient shock absorbent material, such as excelsior, and wrap the Model 58 securely in cloth before inserting it into the packing case. REMEMBER THE MODEL 58 IS A VALUABLE INSTRUMENT AND IS WORTH EVERY CARE IN PACKING.

5.03 Maintenance Precautions

(1) It is strongly recommended that a complete analysis of any trouble be made, preferably in writing, before attempting repairs. Much trouble shooting can be done by observing the operation of panel controls and devices without removing the unit from its case.

(2) The following paragraphs explain possible causes of abnormal indications. Once the complete facts on performance are known it may not be necessary to remove the instrument from its case.

(3) MAJOR REPAIRS, ELECTRICAL ALIGNMENTS, OR REPLACEMENT OF PARTS IF ATTEMPTED AT ALL, SHOULD BE MADE IN A PROPERLY EQUIPPED LABORATORY BY EXPERIENCED MAINTENANCE PERSONNEL. IN GENERAL, THE LESS THE MODEL 58 IS TAMPERED WITH THE BETTER. WHERE FAULTY OPERATION IS EXPERIENCED, AND THE TROUBLE IS NOT READILY APPARENT, RETURN THE INSTRUMENT TO THE MEASUREMENTS CORPORATION.

5.1 TROUBLE LOCATION

5.10 General

(1) DON'T TAMPER WITH THE INSTRUMENT, ESPECIALLY WHEN IT IS OUT OF ITS CASE.

(2) NEVER MAKE ANY HAPHAZARD TRIMMER OR PADDER ADJUSTMENTS.

5.11 Analysis Prior to Removal From Case

5.111 Significance of MICROVOLT Meter Indications

Prior knowledge of the action of the eight push-button switches under the MICROVOLT meter and their influence on the output meter indications may enlighten the operator in many instances in seeking proper remedial measures when occasions warrant removal of Model 58 from its case. Below is a brief summary of the role of the panel devices concerned. Normal operation of the push buttons require that only one be operated at a time, automatically releasing another that may have been depressed.

Any one of the push buttons when depressed (except OFF button) turns on the power. Also see paragraph 4.5 and the schematic diagram, Figure 6-3.

(1) MICROVOLT meter -- The indicator for all measurements and calibrations involving the action of any push button directly under it (Figure 4-6).

(2) OFF button -- See subparagraph 4.56. Zero indication in MICROVOLT meter when depressed. Any preceding reading should fall to zero.

(3) ADJ push button depressed:

(a) Input signal shorted out. Antenna and attenuator produce no response on output.
(b) MICROVOLT meter connected to measure shot-noise diode plate current.
(c) Shot-noise diode B+ and filament connected for diode current adjustment.
(d) MICROVOLT meter responds to ADJ control knob.

(4) CAL push button depressed:

(a) Input signal and attenuator shorted out.
(b) MICROVOLT meter in output circuit (see Figure 4-6).
(c) Shot-noise diode becomes an active part of receiver input circuit.
(d) MICROVOLT meter responds to CAL control knob.

(5) ZERO push button depressed:

(a) Input signal and attenuator shorted out.
(b) MICROVOLT meter in output circuit.
(c) Shot-noise diode B+ and filament disconnected.
(d) MICROVOLT meter responds to ZERO control knob.
(e) Any previously indicated signal is eliminated from MICROVOLT meter indication.

(6) ATTENUATOR push buttons X1 to X1000 (any one) depressed.

(a) Signal input applied and attenuator connected in the receiver input circuit.
(b) MICROVOLT meter in output circuit.
(c) Shot-noise diode B+ and filament disconnected.
(d) MICROVOLT meter responds to input signal.
(e) Signal reduced in accordance with attenuator step.

(7) The above information should help in relating trouble to a specific cause. Thus, for example, if difficulty is experienced in the adjustment of the ADJ knob, it may be presumed that the shot-noise diode circuit switching action (ADJ push button) or the diode tube needs checking.

5.112 Significance of Headphone Indications

The amount and nature of background noise in the monitoring headphones is also a rough guide to the circuit position of the fault. Complete absence of any sound would possibly be due to power failure or to trouble in the output circuits. Normal microphonic sounds, without hiss, probably indicate a normal audio amplifier system but a faulty radio-frequency system. Weak signals accompanied by background noise might indicate some fault in the antenna system or attenuator circuit.

5.113 Significance of Recorder-to-Ground Connection

With or without the recorder in use, 160 volts normally exist between the RECORDER jacks and the case of the instrument. If this voltage value is lacking, an open or shorted circuit can be presumed to exist in directly connected circuits (Figure 6-3).

5.12 Removing Model 58 from its Case

WARNING: NEVER REST THE INSTRUMENT ON CONTROL PANEL OR USE THE METER FACE COVERS FOR GRASPING OR SUPPORT!

(1) Disconnect all cables from the Model 58.

(2) Remove the two screws from the back of the case. Remove the fourteen binding head screws from around front panel perimeter.

(3) Up-end the instrument with front panel facing the operator and the MICROVOLT meter toward the bottom.

(4) Tilt Model 58 slightly forward supporting the panel with the left hand. Upon loosening rest the instrument on the panel edge, and, still supporting the panel with the left hand, free the case.

(5) Using the carrying strap as a handle carefully pull the case away from the instrument.

5.13 Replacing Model 58 in its Case

(1) To return the instrument to its case set the case on its center strap guide with the opening facing upward.

(2) With the front panel facing upward as for reading, grasp the sides of the panel and gently lower the instrument into the case removing first one hand and then the other.

(3) Replace all sixteen screws, centering the instrument carefully over the holes before securely tightening any of the screws.

5.14 Analysis after Removal from Case

Locate faults by following an orderly, systematic procedure. Make simple routine checks first; check tubes, take resistance and voltage measurements (Figures 5-1, 5-2). Attempt to determine whether the trouble is in the attenuator, the r-f or oscillator circuits, the intermediate frequency amplifiers, the power supply circuits, the meter indicating circuits, etc. After the difficulty is traced to one definite section proceed in a series of logical steps to further isolate the fault. For example:- determine if the trouble is common to all frequency bands. If it is found to be in one band only, probably the trouble exists only in the radio-frequency converter, or oscillator circuit, since the intermediate frequency, output, power supply and meter indicating circuits are in use on all bands. Moreover, if the trouble is confined to a single frequency band, elements common to all bands are not at fault. Thus the main tuning capacitor, vacuum tubes and associated sockets and circuit components may be exempt from suspicion. You would then suspect one of the elements selected by the switching operation or the switch itself. The coil assemblies and the frequency band switch should, therefore, receive attention. At this point make a resistance analysis of the r-f amplifier, converter, and oscillator circuits to determine which is defective. If, in the defective circuit, the indicated resistance value changes with a slight pressure on a band switch button, it might indicate a faulty contact; but if the abnormal resistance value remains constant the fault is probably in the coil assembly or wiring. Examine the switch and wiring of the particular stage and, if these appear to be in operating condition, investigate the coil assembly. Visual examination of the individual switch contacts may disclose the defect (paragraph 5.5).

Possible troubles and their remedies are indicated in subparagraph 5.15 below.

5.15 Trouble Shooter's Chart

Don't disturb internal screwdriver adjustments; don't move r-f coils, etc. For such repairs return the instrument to the MEASUREMENTS CORPORATION. If this isn't feasible read the applicable instructions before proceeding.

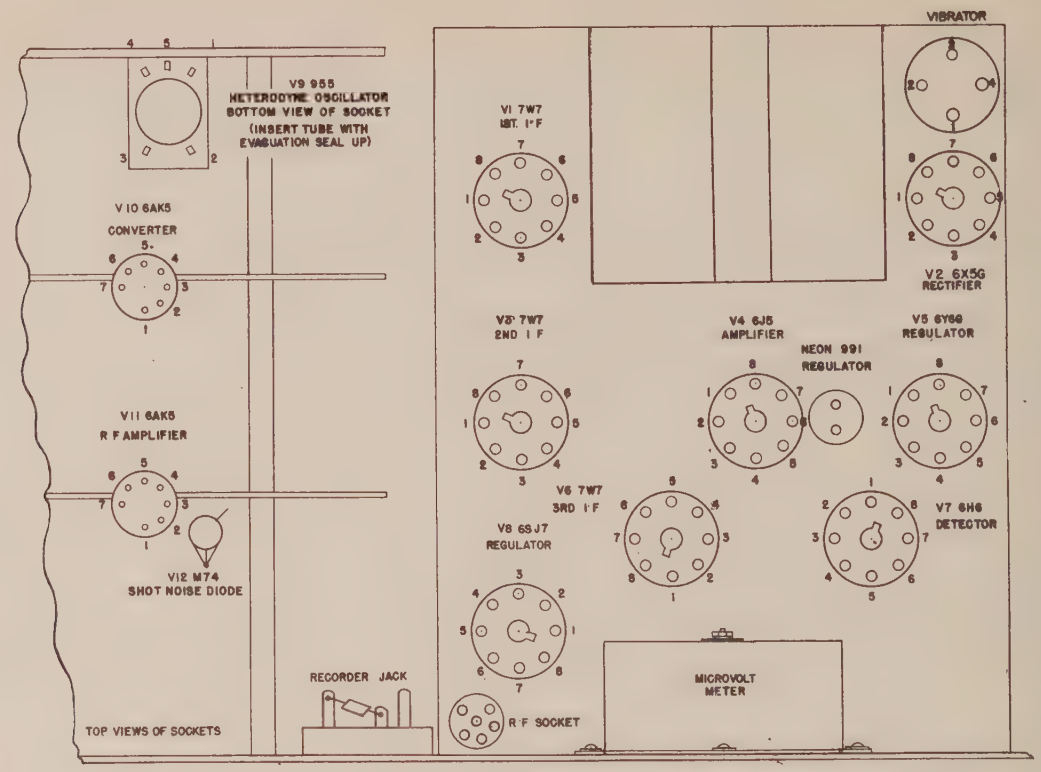
TROUBLE	POSSIBLE CAUSE	REMEDY
No signal	Blown fuse	Replace
No signal	Break in continuity of power input cable, possibly at plug	Locate and repair. Seat power plug firmly against panel.
	Shorted filter or by-pass capacitor	Locate and replace.
	Poor contact between antenna cable receptacles and mating plugs	Locate and correct. Tighten coupling rings securely.
	Burned out vacuum tube	Locate and replace.
Weak signal	Weak vacuum tube	Locate and replace.
	Misalignment of r-f or i-f circuits	Check and realign (paragraph 5.7).
Intermittent noise during tuning	Loose or dirty wipers on gang tuning capacitor	Clean and tighten.
Intermittent noise caused by vibration	Defective or dirty contact on operations or frequency range switches	Locate and correct (subparagraph 5.50).
Intermittent reception	Connecting cables loosely mated	Locate and correct.
	Defective control	Locate and replace.
	Poor contact between vacuum tube and socket	Locate and correct (subparagraph 5.50).
	Defective vacuum tube	To locate, tap each tube lightly; replace.
	Frayed or broken connection in wiring	Locate and correct.
	Defective by-pass or coupling capacitor	Locate and replace.
	Loose retaining nut on shield can	Locate and tighten.
Signal evident in headphones but MICROVOLT meter does not indicate	Open or shorted connection in output bridge circuit (Figures 4-6, 6-3)	Locate and correct.
MICROVOLT meter off-scale to left or right	MICROVOLT meter open or shorted	Check -- return meter to MEASUREMENTS CORPORATION for repairs.
CALIBRATION scale and MEGACYCLE pointer does not rotate as tuning knob is turned	Broken or loose dial cord	Tighten or replace (subparagraph 5.53).
Attenuator buttons don't reduce (or increase) readings in proper proportion	Poor switch contacts	Locate and clean (subparagraph 5.50).
	Defective or open resistor in attenuator block	Locate and replace (subparagraph 5.23).

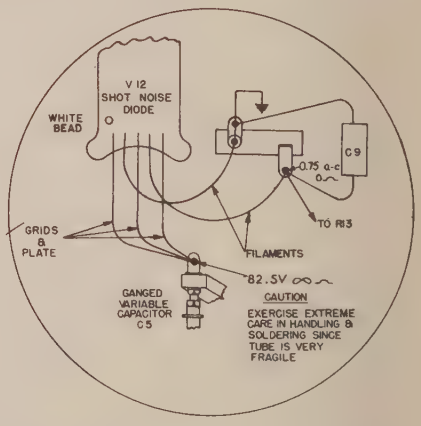
TROUBLE	POSSIBLE CAUSE	REMEDY
Operates on a-c but not on d-c	Blown fuse in d-c cable	Replace.
	Poor contacts between vibrator pins and socket	Clean (subparagraph 5.50).
	Defective vibrator	Replace.
	Low or dead battery	Recharge or replace.
Vibrator hash	Poor contact between vibrator shield and chassis	Locate and correct.
	Defective resistor or capacitor component in vibrator circuit (Figure 4-7)	Locate and replace.
	Faulty vibrator	Check vibrator in vibrator checker or as follows: (1) Connect 2-ohm, 25-watt resistor and 0-to 10-v a-c voltmeter across pins 2 and 3. (2) Apply 6 v across pins 1 and 4. (3) If vibrator is operating properly meter will read approximately 9 v rms.
Dead or smoke	Rotor insulation failure on tuning capacitor due to arcing (especially at high altitude)	Keep insulator segments clean and dry. If badly carbonized - return to MEASUREMENTS CORPORATION for replacement.
	Shorts B+ and burns out resistor R5 or R14	Check and replace if necessary.
	Shorted by-pass or filter capacitor	Locate and replace.
Excessive hum	Defective rectifier or tube in regulator circuit	Check tubes and replace if necessary.
	Defective neon tube	Replace.
	Open capacitor in filter circuits (Figure 4-7)	Locate and replace.
	Open grid return or defective bias cell	Check grid return continuity and grid loading resistors. CAUTION: Don't use ordinary voltmeter (paragraph 5.4).
B+ more or less than 200 v at regulator output or impossible to regulate to 250 v.	Defective rectifier or tube in regulator circuit	Check tubes and replace defective ones.
	Defective neon tube	Replace.
	Defective resistor or capacitor in regulator circuit	Locate and replace.
	Improper setting of B PLUS control	Reset (subparagraph 4.63).

5.2 VOLTAGE AND RESISTANCE MEASUREMENTS

5.20 General

The voltage and resistance measurements (Figure 5-2) give readings between the respective points indicated and the chassis under the conditions listed. Variation of more than 20 percent from the values shown indicates trouble in the circuit being measured or in directly connected circuits.





Replacement of shot-noise diode

FIGURE 5-1
TUBE LOCATIONS

TUBE	PIN	VOLTS	OHMS	CONDITION
V1 7W7 1st I-F	1 2 3 4 5 6 7 8	6.1 a-c +250 +130 0 0 0 0 0	0 11,000 22,000 0 0 80,000 0 0	
V2 6X5G Rectifier	1 2 3 4 5 6 7 8	- - 500 a-c 0 500 a-c 0 6.2 a-c 0	- - 300 ∞ 280 ∞ 0 ∞	
V3 7W7 2nd I-F	1 2 3 4 5 6 7 8	6.1 a-c +250 +140 0 0 0 0 0	0 11,000 21,000 ∞ 0 80,000 0 0	
V4 6J5 Amplifier	1 2 3 4 5 6 7 8	0 6 a-c +200 0 -0.2 0 0 0	0 0 10,000 ∞ 400,000 ∞ 0 0	
V5 6Y6G Regulator	1 2 3 4 5 6 7 8	0 0 +600 +600 0 0 6.4 a-c -0.1	0 0 0 0 60,000 ∞ 0 10,000	
V6 7W7 3rd I-F	1 2 3 4 5 6 7 8	0 +250 +250 0 0 0 0 6 a-c	0 11,000 55,000 ∞ 0 0 0 0	
V7 6H6 Detector	1 2 3 4 5 6 7 8	0 0 0 0 0 0 6 a-c 0	0 0 7,500,000 0 7,500,000 ∞ 0 0	

TUBE	PIN	VOLTS	OHMS	CONDITION
V8 6SJ7GT/G	1 2 3 4 5 6 7 8	0 6 a-c +55 +50 +55 +245 0 +210	0 0 13,500 10,000 13,500 70,000 0 60,000	
V9 955 Oscillator	1 2 3 4 5	0 +250 0 6.2 a-c 0	0 22,000 22,000 0 0	
V10 6AK5 Converter	1 2 3 4 5 6 7	-0.95 0 0 6.2 a-c +245 +215 0	16,500 0 0 0 50,000 70,000 0	
V11 6AK5 R-F Amplifier	1 2 3 4 5 6 7	-0.4 0 0 6.2 a-c +250 +150 0	18,500 0 0 0 48,000 40,000 0	
V12 Shot-Noise Diode M74	See Figure 5-1b			Tube in Socket; ADJ Button in; Output Meter reads in ADJ Area.
R-F Socket	1 2 3 4 5	6.2 a-c +150 +250 6.2 a-c +250	0 40,000 12,000 0 11,000	ADJ Button in. ADJ Button in.
Vibrator	1 2 3 4	0 0 4 a-c 4 a-c	∞ 0 0.1 0.1	
Neon 991 Regulator	1 2	0 +300	13,000	
Recorder Jack	All Three Terminals	170	10,000	No Tips and Jacks.

FIGURE 5-2
Resistance and voltage measurements

5.21 Voltage Measurement Conditions

(1) 20,000 ohm/volt meter.
(2) 117-v, 60-cycle, a-c input.
(3) Band A, MEGACYCLE pointer at 24 mc.
(4) No signal input
(5) Panel controls full counterclockwise.
(6) (A-Band and ZERO push buttons depressed.
(7) Tubes in sockets except one in socket being measured.
(8) See Figure 5-2 for voltage measurements.

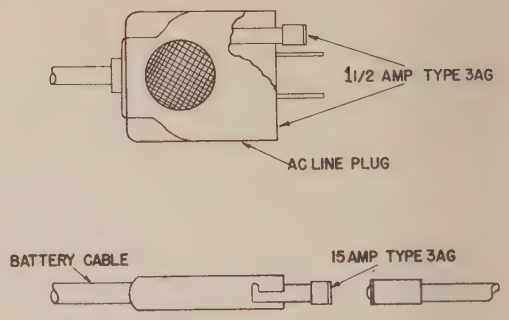


FIGURE 5-3
Fuse replacement detail

5.22 Resistance Measurement Conditions

(1) Any standard ohmmeter.
(2) All cables disconnected.
(3) Panel controls full counterclockwise.
(4) (A-Band and ZERO push buttons depressed.
(5) Tubes in sockets, except one in socket being measured.
(6) No signal input.
(7) See Figure 5-2 for resistance measurements.

5.23 Checking Attenuation Resistance Ratios

(1) Attach three-foot antenna cable (A213)to the Model 58. Don't connect the Model 58 to a power source.

(2) Connect ohmmeter to antenna cable end terminals.

(3) Release all range buttons by partly depressing each.

(4) Depress attenuator buttons one by one and read ohmmeter for each one. The meter should read 72 ohms for each if none of the attenuator resistors is defective.

(5) Repeat procedure above from each line to the center terminal. Ohmmeter should read approximately 36 ohms.

5.3 TUBE, FUSE, AND VIBRATOR LOCATIONS

(1) See Figure 5-1 for tube and vibrator locations. It is necessary to remove the r-f shield can to replace the r-f, oscillator, and converter tubes (subparagraph 5.51).

(2) See Figure 5-3 for fuse locations.

5.4 BIAS CELL TEST AND REPLACEMENT

The simplest method of checking bias cell voltage is first to measure the plate current of the tube which uses the cell. Remove the cell and short the mounting. A second check of plate current after this should show a considerable increase if the bias cell was normal.

Since one microampere of current is excessive for a bias cell, obviously, even a 20,000-ohm-per-volt meter isn't suitable for checking its voltage. A d-c vacuum tube voltmeter, such as the MEASUREMENTS Model 62, without a resistor across its input circuit is the only voltmeter suitable for making such a check. (Voltage = 1 volt per cell).

Figures 6-1, 6-2 show the bias cell location.

5.5 REPAIRS AND REPLACEMENTS

5.50 General Service Notes

5.501 Cleaning Tube Socket and Switch Contacts

To clean tube socket pins or switch contacts use naphtha (or a solution of half alcohol and half ether) on a soft rag or brush, then wipe dry.

CAUTION: NEVER USE SANDPAPER OR EMERY CLOTH.

5.502 Soldering

Use rosin flux and 50 - 50 solder only in making soldered joints. After soldering clean off excess flux with alcohol on a soft rag or brush.

5.51 R-F Shield Can Removal

(1) Remove instrument from its case (subparagraph 5.12).

(2) Pull the r-f ground spring up and away from the i-f connector plug (Figure 4-2).

(3) Push in i-f connector plug slightly, turn counterclockwise 1/4 turn, and pull out of receptacle.

(4) Remove screw from rear of shield can.

(5) Carefully remove the r-f shield can from its base.

(6) In replacing make sure that the slots in the shield can mate with the holes in the shield base and that the r-f ground spring makes firm positive contact with the i-f connector plug.

5.52 Removing R-F Assembly from Front Panel

(1) Remove instrument from its case (subparagraph 5.12).

(2) Pull off the five lettered frequency range buttons from their push rods (Figure 5-4).

(3) Turn frequency knob fully counterclockwise to bring the MEGACYCLE pointer to rest along the numbers of the low frequency (maximum capacity) end of the scale. At the same time the line on the CALIBRATION scale will be located directly to the left of the band letters in the dial window.

(4) Loosen the two frequency knob set screws and slide the knob off its shaft.

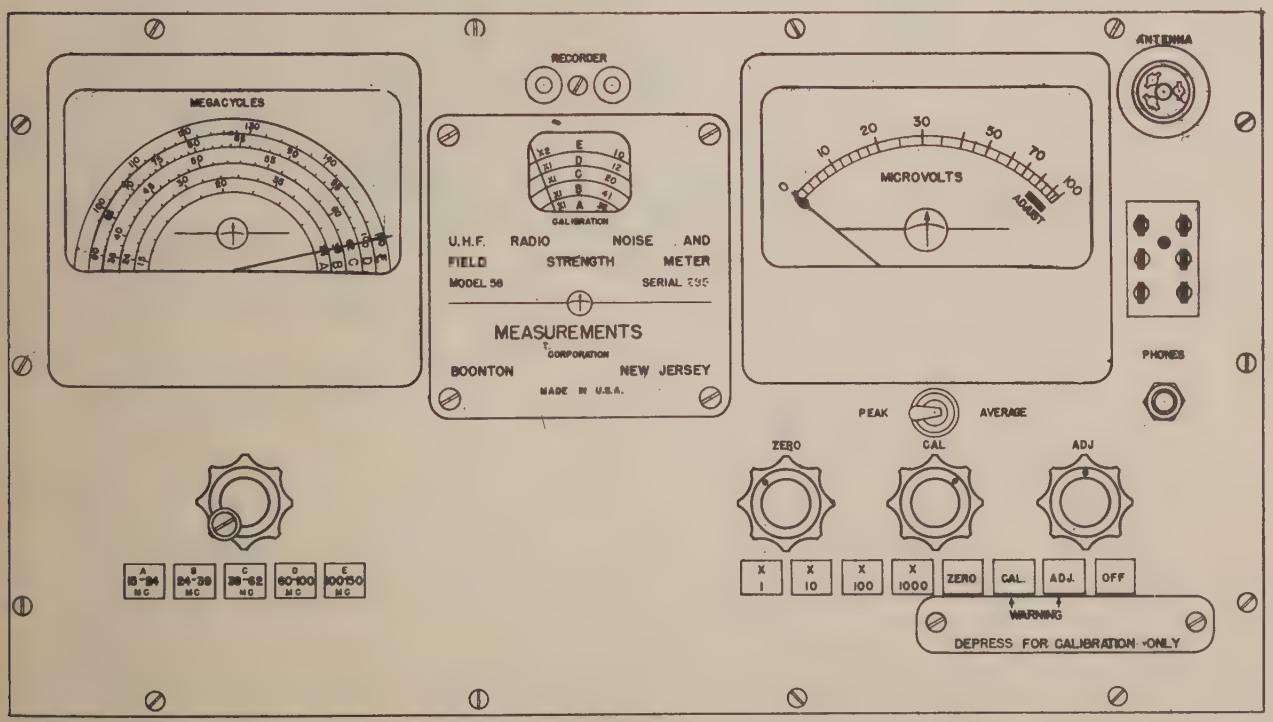


FIGURE 5-4
Front panel details

(5) From back of the panel remove the two screws holding the MEGACYCLE dial dust cover to the panel. Remove the screw and the two washers sandwiching the base of the dial pointer to its shaft.

(6) Remove the four screws that hold the CALIBRATION scale cover in place. Then detach the white CALIBRATION scale by means of its center screw and two washers.

(7) Remove the two screws at the lower left side of the panel that hold the brass front plate to the panel.

(8) Remove the screw close by the CALIBRATION scale shaft.

(9) To complete the removal of the assembly remove the round head screw and washer at the left side under the MEGACYCLE scale.

(10) For replacing, retrace all steps in the reverse order following the panel locations shown in Figure 5-4.

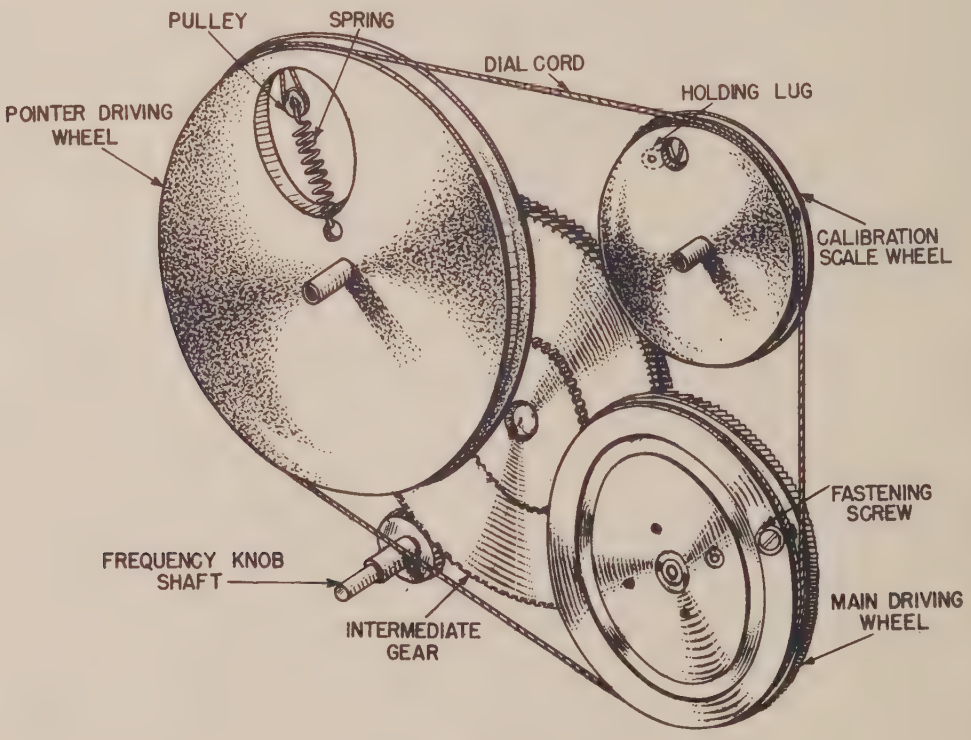


FIGURE 5-5
Dial drive cord replacement detail

5.53 Dial Drive Cord Replacement

(1) Remove the r-f assembly from the front panel (subparagraph 5.52).

(2) Remove the brass front plate.

(3) Use 45 inches of 15 thread, 45 pound test fish line properly stretched and prepared for use as a dial cable.

(4) Before applying the dial cord set the three wheels in the relative positions indicated in Figure 5-5, remove the fastening screw and bend the holding lug open.

(5) Make a small loop in the cord 15 inches from one end and insert it through the hole in the rim of the main driving wheel. Anchor with the fastening screw.

(6) Feed the longer end once around the wheel counterclockwise completing the turn under the loose end. Use masking tape to hold cord in the groove while stringing.

(7) Continue stretching the cord once around the CALIBRATION scale wheel counterclockwise. Feed a small loop through the hole in the rim and anchor with the holding lug. The dial cord should be taut but not rigid. Clamp the CALIBRATION scale wheel to hold it stationary. Use masking tape to hold cord in groove while stringing.

(8) Stretch the two ends over the frequency knob shaft* and around the pointer driving wheel inserting them in the hole in the rim as shown in Figure 5-5.

(9) Release pointer driving wheel from its bearings, hook end of spring in its hole; run cord around pulley and tie under tension with single square knot, then return pulley to its bearings to give stretch to spring.

(10) Cut off excess string at knot and coat knot with ambroid.

(11) Remove clamps and masking tape.

(12) Replace the brass front plate.

5.54 Reassembling R-F Unit and Pointer

(1) Place the assembly in position against the front panel and insert round head screw and washer at left side of panel under MEGACYCLE scale.

(2) Insert the screw close by the CALIBRATION scale shaft.

(3) Secure the assembly to the panel with the two screws at the lower left side of the panel.

(4) To align pointer, place variable capacitor in full mesh position and align plates with straight edge. Rotate tuning knob fifteen full turns (away from full mesh). Then adjust pointer to cover 150-mc line. Reassemble MEGACYCLE dial pointer to its shaft with the screw and the two washers sandwiching the base of the pointer.

(5) Reassemble the CALIBRATION scale with the screw and two washers. Set the first row of calibration numbers under the letters designating the bands.

(6) Put back the two scale covers, four front panel screws to hold the CALIBRATION scale cover and two back panel screws for the MEGACYCLE cover.

(7) Slide frequency knob back on its shaft and tighten the two set screws in the knob.

(8) Put back the five lettered frequency range buttons on their push rods (Figure 5-4).

(9) Return instrument to its case (subparagraph 5.13).

5.55 Operation Switch Removal

5.550 General

It may be necessary to remove operation switch to gain access to nearby components underneath the chassis (Figure 6-1).

5.551 Removal Procedure

(1) Remove instrument from its case (subparagraph 5.12).

(2) Pull off the eight lettered buttons (Figure 5-4).

(3) Disconnect the three leads from the r-f assembly to the attenuator block terminal strip and disconnect the ground lug on the chassis bracket (Figure 4-3). Tag all disconnected leads to assure exact replacement.

---

*If the frequency knob shaft becomes disengaged from the intermediate gear, rotate the two sections of the gear a distance equal to one tooth in opposite directions (the front section clockwise and the rear section counterclockwise) before remeshing.

(4) Remove the two binding head screws which hold the switch to the front panel and unscrew the left hand warning plate screw a few turns.

(5) To remove the assembly:

(a) Carefully pull the thin attenuator ground sheet loose from between the chassis and the front panel.

(b) Loosen cabled wires from wedged position between assembly and chassis bracket and slide the switch assembly toward rear of chassis. Gently push aside any obstructing components, to release the push rods and then lift out.

(6) Reassemble in reverse order.

5.56 Tube Base Shield Cover Removal

5.560 General

Removal of tube base shield cover may be necessary to gain access to socket terminals and parts or to replace button by-pass capacitors. Care should be exercised in such replacement; don't tighten the screw too tightly to distort can or short by-pass capacitor.

5.561 Removal Procedure

(1) Remove the instrument from its case (subparagraph 5.12).

(2) To remove the covers from the second i-f (V3), third i-f (V6), or detector (V7) tubes it is necessary to remove the GAIN, AVC, B PLUS control assembly. Two screws hold it in place (Figures 4-3, 6-1).

(3) To remove the cover from the first i-f tube (V1) it is necessary to disconnect and remove the 8-μf electrolytic capacitor (C53) from its clamp.

(4) With a screwdriver gently pry off the required cover taking care not to distort or damage the cover or shield. Match dimples in cover and can when reassembling.

5.57 Switch Contact Repairs

(1) Examine the operations and frequency band switch contacts to make sure that the pair of wipers make reliable connection with the push-rod blades.

(2) The pairs of wiping contacts should press against each other so that if the right-hand wiper is gently moved away from the left-hand wiper, the left-hand wiper will follow to a limited extent. To accomplish this, gently push the wipers towards each other, shaping first one, then the other. (The push-rod blade must be first disengaged!). There must be no clearance between the pair of wipers when push-rod blade is disengaged.

(3) Clean with naphtha (or a solution of half alcohol and half ether) on a soft rag or brush, then wipe dry. NEVER USE SANDPAPER OR EMERY CLOTH!

5.6 INTERNAL ADJUSTMENTS

5.60 General

There are three internal controls, GAIN, AVC, B PLUS, (Figure 4-3) which have been carefully preset at the factory for optimum performance of the Model 58. The adjustment of these controls affects the alignment and standardization of the instrument and should not be attempted except during these latter operations (paragraphs 5.8, 5.9). Readjustment of the AVC and GAIN controls is required if the attenuation ratios don't check and the resistors are not defective (subparagraph 5.23). The replacement of the 6J5 and/or first and second i-f tubes (7W7) may call for readjustment of these controls.

5.61 Gain Adjustment

(1) Connect the Model 58 and signal generator as for i-f alignment (Figure 5-6).

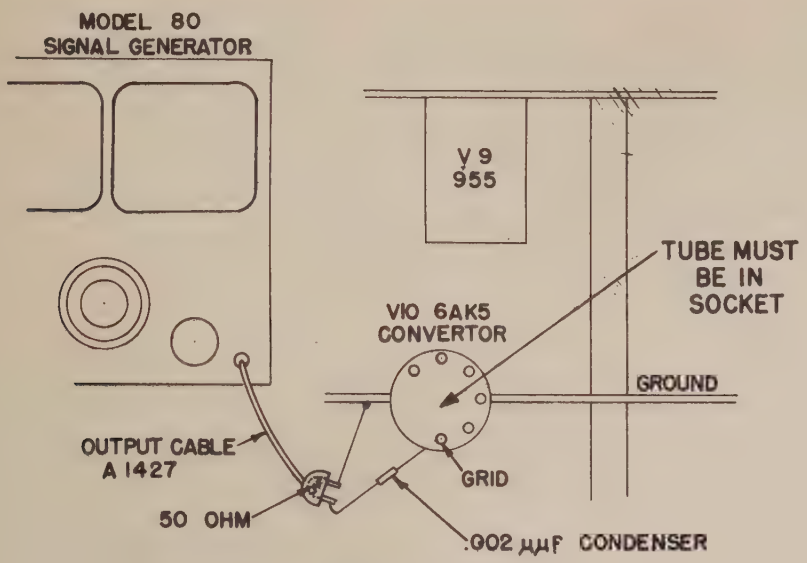


FIGURE 5-6a
I-F alignment hook-up

(2) Feed an unmodulated, 12-mc, 150-µv signal to the grid of the mixer tube. Set the output of the signal generator to zero and adjust the ZERO control on the Model 58 so that MICROVOLT meter reads zero.

(3) Set PEAK-AVERAGE switch to AVERAGE, depress X1 attenuator button, leave other controls in their normal operating positions.

(4) Adjust GAIN control to obtain full scale reading on the MICROVOLT meter on the Model 58.

5.62 AVC Adjustment

See subparagraph 4.62.

5.63 B PLUS Adjustment

See subparagraph 4.63.

5.7 ALIGNMENT

CAUTION: THE MODEL 58 HAS BEEN CAREFULLY AND COMPLETELY ALIGNED AT THE FACTORY. DON'T ATTEMPT REALIGNMENT UNLESS ABSOLUTELY NECESSARY. MISALIGNMENT IS USUALLY INDICATED BY IMPROPER MEGACYCLE SCALE CALIBRATION. REALIGNMENT MUST BE PERFORMED ONLY BY TRAINED MAINTENANCE PERSONNEL WITH PROPER EQUIPMENT. IN SUCH CASES IT IS USUALLY BEST TO RETURN THE INSTRUMENT TO THE MEASUREMENTS CORPORATION.

5.71 Purpose

Alignment accomplishes the peaking of the individual r-f and i-f stages for the proper dial setting and for optimum performance of the instrument.

5.72 Equipment Required

(1) A laboratory type signal generator such as the MEASUREMENTS Model 80, with a frequency range from 12 to 150 mc and with a calibrated output. (MEASUREMENTS Model 80 is recommended).

(2) Any voltmeter with a range including 250 volts.

(3) An insulated alignment screwdriver.

(4) Two 36-ohm carbon resistors for r-f alignment and a 0.002-μf capacitor for i-f alignment.

(5) A source of power for the Model 58 and the test equipment.

(6) A shielded test room.

5.73 I-F Alignment

(1) Remove the Model 58 from its case (subparagraph 5.12) and hook-up on a bench as shown in Figure 5-6 for i-f alignment inside a shielded test room.

(2) Depress X1 button, release all band switch buttons by depressing part way in, set PEAK-AVERAGE switch to AVERAGE on Model 58, and turn on signal generator. Allow both at least thirty minutes to warm up.

(3) Connect voltmeter across C53 (8 μf). Adjust B PLUS control (Figure 4-3) till voltmeter reads 250 volts. Disconnect the voltmeter.

(4) Set the signal generator to 12 mc, unmodulated, and adjust its output so that the Model 58 MICROVOLT meter reads about half scale. Throughout the trimmer adjustment continually reduce the signal generator output to approximate this reading.

(5) Adjust the i-f trimmers on T5, T4, T3, T2, and T1 (Figure 5-1 a,b) in that order for maximum indication on the MICROVOLT meter. Repeat this operation until no further adjustment is required.

(6) With the signal generator output at zero adjust the ZERO knob (Figure 5-4) until the MICROVOLT meter reads zero.

(7) Increase the output of the signal generator until the Model 58 MICROVOLT meter reads 100. Record the signal generator output indication. Decrease the output of the signal generator to 1/10 of this value. Model 58 MICROVOLT meter will read 10 if the AVC control is set correctly. If the meter reads less than 10 turn the AVC control (Figure 4-3) clockwise until it reads 10, and vice versa. (This is a preliminary adjustment.)

(8) Repeat instructions (6) and (7) until no further adjustment is required.

(9) Repeat instructions (4) and (5). If the i-f sensitivity does not fall between 120 μv and 180 μv adjust GAIN control and repeat instruction (7).

5.74 Oscillator and R-F Alignment

5.741 Test Conditions and Instructions

(1) I-f alignment (subparagraph 5.73) must be completed before attempting oscillator and r-f alignment.

(2) Hook-up the equipment as shown in Figure 5-6 for oscillator and r-f alignment. Allow at least thirty minutes for warming up after the equipment is turned on.

(3) Set signal generator frequency and Model 58 MEGACYCLE dial as indicated in columns 2 and 3 respectively, in table below.

1 Band	2 Sig. Gen. Freq. (mc)	3 Model 58 MEGACYCLE Dial Exactly	4 Trim in Sequence for Max. MICROVOLT Reading	5
E	145	145	C3E, C2E, C1E	Repeat adjustment in column 4.
D	95	95	C3D, C2D, C1D	Repeat adjustment in column 4.
C	60	60	C3C, C2C, C1C	Repeat adjustment in column 4.
B	38	38	C3B, C2B, C1B	Repeat adjustment in column 4.
A	23	23	C3A, C2A, C1A	Repeat adjustment in column 4.

(4) Adjust the signal generator for an unmodulated output with a level sufficient to make the Model 58 MICROVOLT meter read approximately half scale. Throughout the trimmer adjustment continually reduce the signal generator output to approximate this reading.

(5) Adjust the trimmers for each band at the frequencies indicated and in the sequence shown in column 4 of instruction (3). See Figure 5-8 for trimmer locations. Use an insulated screwdriver for trimming.

(6) Set the signal generator to 50 mc unmodulated and turn its output to zero.

(7) Adjust ZERO knob (Figure 5-4) until MICROVOLT meter reads zero.

(8) Increase output of signal generator to 100μv. Adjust CAL until MICROVOLT meter on Model 58 reads 100. Check ZERO and repeat. Decrease the output of the signal generator to 1/10 of this value. Model 58 MICROVOLT meter will read 10 if the AVC control is set properly. If the meter reads less than 10 turn the AVC control (Figure 4-3) clockwise until it reads 10, or vice versa.

(9) Repeat instructions (6), (7), and (8) until no further adjustment is required.

(10) Set the signal generator output for a 30 μv signal. The MICROVOLT meter on the Model 58 should indicate 30 ±3 μv. If not, repeat AVC adjustment outlined in instructions (6), (7) and (8).

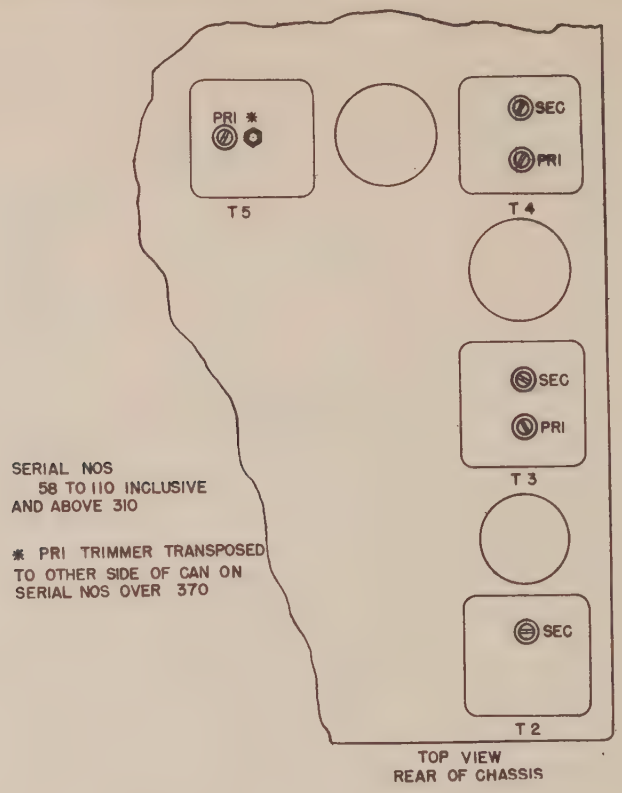
(11) After alignment standardize the instrument as outlined in paragraph 5.8.

5.8 SENSITIVITY STANDARDIZATION

5.81 Purpose

(This operation should not be confused with calibrating for the particular operating frequency discussed in paragraph 2.5). Sensitivity standardization establishes a meter indication in terms of shot noise for use in calibrating in the field. Replacement of the shot-noise diode or realignment of the Model 58 may alter the original factory standardization indicated on the CALIBRATION scale (Figure 5-4).

CAUTION: THE ACCURACY OF THE MODEL 58 DEPENDS ENTIRELY UPON THE ACCURACY OF ITS SENSITIVITY STANDARDIZATION. IT IS STRONGLY RECOMMENDED THAT THE INSTRUMENT BE RETURNED TO THE MEASUREMENTS CORPORATION SHOULD STANDARDIZATION BE NECESSARY.



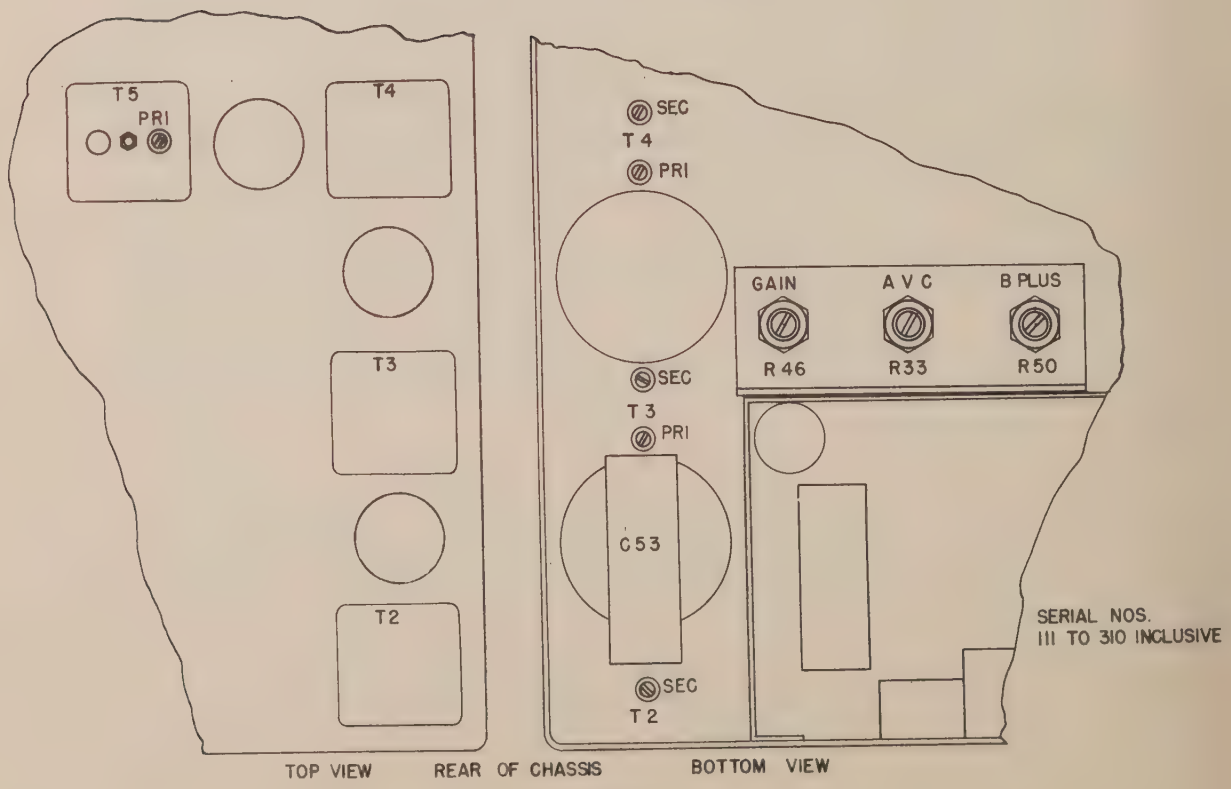


FIGURE 5-7
I-f trimmer locations

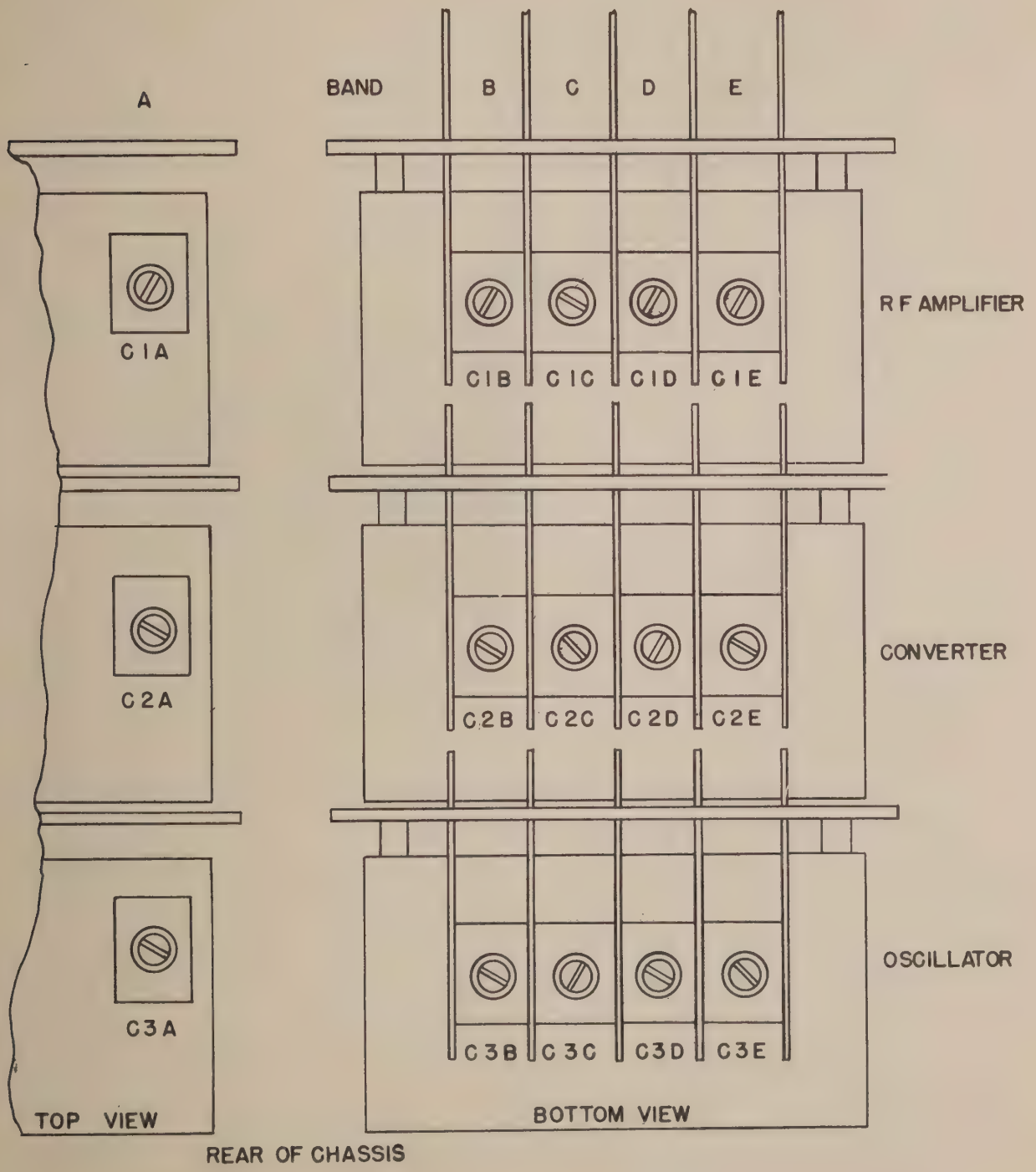


FIGURE 5-8
Oscillator and r-f trimmer locations

5.82 Equipment Required

(1) A laboratory type signal generator, such as the MEASUREMENTS Model 80 with a frequency range from 12 to 150 mc and with a calibrated output.

(2) See Figure 5-6b for network detail.

(3) A source of power for the Model 58 and the test equipment.

(4) A shielded test room.

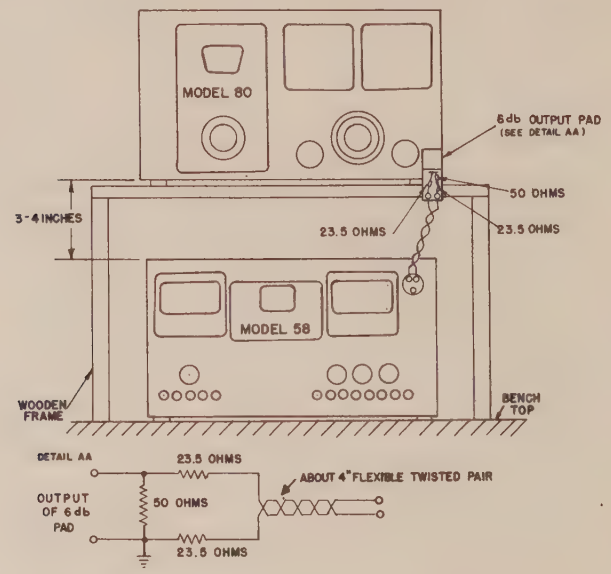


FIGURE 5-6b
Hook-up for r-f and oscillator alignment and sensitivity standardization

5.83 Standardization Procedure

(1) I-f, oscillator, and r-f alignment (subparagraphs 5.73, 5.74) must be completed before attempting sensitivity standardization.

(2) Hook-up the equipment as shown in Figure 5-6 for sensitivity standardization. Allow at least 15 minutes for warm up after the equipment is turned on.

(3) Depress X1 attenuator button, set PEAK-AVERAGE switch to AVERAGE, depress E-band button and tune MEGACYCLE dial to 150 megacycles.

(4) Tune signal generator in the neighborhood of 150 megacycles until the Model 58 MICROVOLT meter reads maximum. Adjust the signal generator for an unmodulated signal with an output level of 200 microvolts.*

(5) Depress ZERO button and adjust ZERO knob until MICROVOLT meter reads zero.

(6) Depress X1 button and adjust CAL knob until MICROVOLT meter reads 100.

(7) Repeat (4) and (5) until no further adjustment is necessary.

(8) Depress ADJ button and adjust ADJ knob until MICROVOLT meter reads in the center of the black region marked ADJUST (Figure 5-4).

(9) Depress CAL button and record MICROVOLT meter reading (calibration number) alongside 150 mc on the shot-noise calibration sheet, (Figure 5-9).

(10) Set the Model 58 MEGACYCLE dial to 147 mc, tune signal generator for maximum MICROVOLT meter reading, and obtain a calibration number for this frequency in the same manner as outlined for 150 mc.

*In sets with serial numbers above 310, the sensitivity of E Band is one-half that of bands A,B,C, and D. In all models the reciprocal of the sensitivity of each band is indicated on the CALIBRATION scale when the MEGACYCLE pointer is on the high frequency end of the dial.

(11) Repeat the procedure for each of the frequencies listed on the calibration sheet (Figure 5-9) for E band.

(12) With the signal generator output level at 100 microvolts* (instead of at 200) repeat the procedure for the frequencies listed for the D,C,B, and A bands.

(13) Obtain all the calibration numbers for each of the bands as outlined; then reverse the generator connections to the Model 58. Starting with 150 mc obtain a second set of calibration numbers in the same manner. This corrects for any unbalance in the input connection to the Model 58.

(14) Use the average of each of the two readings in future calibration procedures.

(15) If desired the old calibration numbers on the CALIBRATION dial may be erased and new ones subsituted.

NOTE: FOR EMERGENCY USE

If insufficient gain or too much noise prevents calibrating 1 to 1 on any band, the Model 58 can be calibrated 2 to 1 if the reason for the low gain can not readily be determined. Most likely the trouble is traceable to poor 6AK5 tubes or poor r-f tracking. In any case, return to MEASUREMENTS CORPORATION for repairs at earliest convenience.

5.9 CALIBRATION PROCEDURE FOR HIGH-IMPEDANCE PROBE B265

5.90 General

It is recommended that the probe be calibrated with the particular Model 58 with which it is to be used. Two calibrations are desirable, one for the X1 attenuator range and one additional set of data for X10. This later set of data can be used on X100 and X1000 also.

INPUT RATIO X1				INPUT RATIO X1				INPUT RATIO X1				INPUT RATIO X1				INPUT RATIO X2			
BAND A FREQUENCY	CALIBRATION NUMBER			BAND B FREQUENCY	CALIBRATION NUMBER			BAND C FREQUENCY	CALIBRATION NUMBER			BAND D FREQUENCY	CALIBRATION NUMBER			BAND E FREQUENCY	CALIBRATION NUMBER		
	1ST SET	2ND SET	AVER		1ST SET	2ND SET	AVER		1ST SET	2ND SET	AVER		1ST SET	2ND SET	AVER		1ST SET	2ND SET	AVER
24				38				65				100				150			
				36.8				62.8				97.5				147			
22.8				36				61				95				144			
				34.8				59				91.5				140			
21.3				33.5				57				88.5				136			
				32.3				54.5				85				131			
19.8				31.4				53				82.5				127			
				30.3				50.5				79				122			
18.2				28.8				48				75				116			
				27.2				45				71				110			
16.5				26				43				67				105			
				24				41				64				100			
15								38											

FIGURE 5-9
Shot noise calibration chart

*See footnote on preceding page.

5.91 Calibration Procedure

(1) Connect probe to Model 58 by means of the 15-foot antenna connection cable.

(2) Connect a standard signal generator, such as MEASUREMENTS Model 80, to the input terminals of probe using short leads.

(3) Calibrate Model 58 using calibration number on CALIBRATION dial (paragraph 5.8).

(4) Depress E-Band and XI button on Model 58 and set MEGACYCLE dial on Model 58 to 150 mc.

(5) Tune signal generator (near 150 mc) for maximum MICROVOLT meter reading on Model 58.

(6) Set band switch on probe to E band.

(7) Adjust tuning capacitor on probe until output meter on Model 58 reads maximum. (Signal generator, Model 58, and probe are now tuned to same frequency).

(8) Adjust output control on signal generator until MICROVOLT meter on Model 58 reads 100 microvolts. Record output of signal generator.

(9) Divide the signal generator output (input to probe) by 200* to obtain the attenuation factor for the frequency in question.

(10) Repeat above procedure at each remaining frequency corresponding to the E band calibration numbers on the Model 58 CALIBRATION dial (Figure 5-4).

(11) Repeat above procedure for bands A,B,C, and D with one exception. The signal generator output is divided by 100 on these bands, rather than 200* as the calibration is one to one.

(12) Obtain another set of numbers for each band with X10 button depressed.

*In sets with serial numbers above 310, the sensitivity of E Band is one half that of bands A,B,C, and D. In all models the reciprocal of the sensitivity of each band is indicated on the CALIBRATION scale when the MEGACYCLE pointer is on the high frequency end of the dial.

SECTION VI

TABLE OF REPLACEABLE PARTS

6.1 MODEL 58 INSTRUMENT.- SEE ERRATA SHEET, FRONT SECTION

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
B1	BIAS CELL: 1 volt	Provides 1 volt negative bias for V-11	Mallory
B2	BIAS CELL: same as B1	Used in series to provide 3 volts negative bias for V10	Mallory
B3	BIAS CELL: same as B1		
B4	BIAS CELL: same as B1		
B5	BIAS CELL: same as B1	Provides 1 volt negative bias for V4, in addition to avc	Mallory
C1A	CAPACITOR: variable trimmer; mica; 2 to 15 μμf	Trimmer in A band antenna tank circuit	Sickles
C1B	CAPACITOR: same as C1A	Trimmer in B band antenna tank circuit	Sickles
C1C	CAPACITOR: same as C1A	Trimmer in C band antenna tank circuit	Sickles
C1D	CAPACITOR: same as C1A	Trimmer in D band antenna tank circuit	Sickles
C1E	CAPACITOR: same as C1A	Trimmer in E band antenna tank circuit	Sickles
C2A	CAPACITOR: same as C1A	Trimmer in A band converter tank circuit	Sickles
C2B	CAPACITOR: same as C1A	Trimmer in B band converter tank circuit	Sickles
C2C	CAPACITOR: same as C1A	Trimmer in C band converter tank circuit	Sickles
C2D	CAPACITOR: same as C1A	Trimmer in D band converter tank circuit	Sickles
C2E	CAPACITOR: same as C1A	Trimmer in E band converter tank circuit	Sickles
C3A	CAPACITOR: same as C1A	Trimmer in A band oscillator tank circuit	Sickles
C3B	CAPACITOR: same as C1A	Trimmer in B band oscillator tank circuit	Sickles
C3C	CAPACITOR: same as C1A	Trimmer in C band oscillator tank circuit	Sickles
C3D	CAPACITOR: same as C1A	Trimmer in D band oscillator tank circuit	Sickles
C3E	CAPACITOR: same as C1A	Trimmer in E band oscillator tank circuit	Sickles
C4A	CAPACITOR: fixed; mica; 93 μμf, ±2%; vdcw	Padder in A band oscillator tank circuit	Aerovox
C4B	CAPACITOR: fixed; mica; 145 μμf, ±2%; vdcw	Padder in B band oscillator tank circuit	Aerovox
C4C	CAPACITOR: fixed; mica; 265 μμf, ±2%; vdcw	Padder in C band oscillator tank circuit	Aerovox

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
C4D	CAPACITOR: fixed; mica; 260 μμf, ±2% vdcw	Padder in D band oscillator tank circuit	Aerovox
C5	CAPACITOR: variable; air dialectric; 3 sections, each 55 μμf	Tunes antenna, converter and oscillator tank circuits to desired frequency on each band	National Co. Type SE-50 Meas. Dwg. B188
C6	CAPACITOR: fixed; mica; 25 μμf, ±10%; 600 vdcw	Couples grid of V8 to grid coil	Micamold "O"XM262
C7	CAPACITOR: fixed; mica; 100 μμf, ±10%; 600 vdcw	R-f by-pass in oscillator tank circuit	Micamold "O"XM262
C8	CAPACITOR: fixed; mica; feed-through type; 300 μμf; 300 vdcw	Part of filament r-f filter network	Cornell-Dubilier #742
C9	CAPACITOR: fixed; mica; 100 μμf, ±10%; 600 vdcw	R-f by-pass in filament of V12	Micamold "O"XM262
C10	CAPACITOR: fixed; mica; 25 μμf, ±10%; 600 vdcw	Couples antenna tank circuit to grid of V11	Micamold "O"XM262
C11	CAPACITOR: fixed; mica; 82 μμf, ±10%; u-h-f type; 600 vdcw	R-f by-pass for antenna tank circuit	Underwood Sil. Mica.
C12	CAPACITOR: fixed; mica; 1500 μμf, +20% -10%; 1000 vdcw	R-f by-pass for filament of V11	Meas. Corp. Dwg. #Q154
C13	CAPACITOR: same as C12	R-f by-pass for screen grid of V11	Meas. Corp. Dwg. #Q154
C14	CAPACITOR: fixed; mica; 25 μμf, ±10%; 600 vdcw	Blocks d-c plate voltage of V11 from grid of V10	Micamold "O"XM262
C15	CAPACITOR: same as C11	R-f by-pass for converter tank circuit	Underwood Sil. Mica.
C16	CAPACITOR: fixed; mica; 1500 μμf, +20% -10%; 1000 vdcw	R-f by-pass in filament circuit of V10	Meas. Corp. Dwg. #Q154
C17	CAPACITOR: same as C16	R-f by-pass for screen grid of V10	Meas. Corp. Dwg. #Q154
C18	CAPACITOR: fixed; mica; 2000 μμf, ±10%; 400 vdcw	R-f by-pass in plate circuit of V10	Solar type MW 1233
*C19	CAPACITOR: fixed; mica; 20 μμf, ±5%	Tunes secondary of T2	Underwood Sil. Mica.
C20	CAPACITOR: same as C12	I-f by-pass for cathode of V1	Meas. Corp. Dwg. #Q154
C21	CAPACITOR: same as C12	I-f by-pass for screen grid of V1	Meas. Corp. Dwg. #Q154
C22	CAPACITOR: same as C12	I-f by-pass for filament of V1	Meas. Corp. Dwg. #Q154
C23	CAPACITOR: same as C12	I-f by-pass for grid of V1	Meas. Corp. Dwg. #Q154
C24	CAPACITOR: same as C12	I-f by-pass for plate of V1	Meas. Corp. Dwg. #Q154
*C25	CAPACITOR: same as C19	Tunes primary of T3	Underwood Sil. Mica.
*C26	CAPACITOR: same as C19	Tunes secondary of T3	Underwood Sil. Mica
C27	CAPACITOR: same as C12	I-f by-pass for grid circuit of V3	Meas. Corp. Dwg. #Q154

* In models with serial numbers below #310, CAPACITOR: variable; trimmer; mica; range 3-30 μμf is used instead.

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
C28	CAPACITOR: same as C12	I-f by-pass for cathode of V3	Meas. Corp. Dwg. #Q154
C29	CAPACITOR: same as C12	I-f by-pass for screen grid of V3	Meas. Corp. Dwg. #Q154
C30	CAPACITOR: same as C12	I-f by-pass for filament of V3	Meas. Corp. Dwg. #Q154
C31	CAPACITOR: same as C12	I-f by-pass for plate circuit of V3	Meas. Corp. Dwg. #Q154
*C32	CAPACITOR: same as C19	Tunes primary of T4	Underwood Sil. Mica.
*C33	CAPACITOR: same as C19	Tunes secondary of T4	Underwood Sil. Mica.
C34	CAPACITOR: same as C12	I-f by-pass for cathode of V6	Meas. Corp. Dwg. #Q154
C35	CAPACITOR: same as C12	I-f by-pass for filament of V6	Meas. Corp. Dwg. #Q154
C36	CAPACITOR: same as C12	I-f by-pass for screen grid of V6	Meas. Corp. Dwg. #Q154
C37	CAPACITOR: same as C12	Part of filter assembly in plate circuit of V6	Meas. Corp. Dwg. A1173
C38	CAPACITOR: same as C12	Part of filter assembly in plate circuit of V6	Meas. Corp. Dwg. A1173
*C39	CAPACITOR: same as C19	Tunes primary of T5	Underwood Sil. Mica.
C40	CAPACITOR: fixed; mica; 100 μμf, +20% -10%; 250 vdcw	Part of filter assembly in plate circuit of V7	Meas. Corp. Dwg. A1172
C41	CAPACITOR: same as C12	I-f by-pass for filament of V7	Meas. Corp. Dwg. #Q154
C42	CAPACITOR: same as C40	Part of filter assembly in plate circuit of V7	Meas. Corp. Dwg. A1172
C43	CAPACITOR: fixed; mica; 100 μμf, ±10%; 600 vdcw	Part of average response network in avc and metering circuit	Micamold "W"XM262
C44	CAPACITOR: fixed; paper; 0.05 μf, ±10%; 400 vdcw	Couples modulation component of signal to grid of V4	Micamold #345
C45	CAPACITOR: fixed; paper; 0.1 μf, ±10%; 400 vdcw	Part of peak response network in avc and metering circuit	Micamold #345
C46	CAPACITOR: fixed; paper; 0.05 μf, ±10%; 400 vdcw	Part of avc filter	Micamold #345
C47	CAPACITOR: same as C46	Couples output of V4 to PHONE jack	Micamold #345
C48	CAPACITOR: fixed; mica; 2000 μμf, ±10%; 400 vdcw	Plate by-pass for V 4	Micamold "W"XM262
C49	CAPACITOR: same as C48	By-pass in PHONE jack circuit	Micamold "W"XM262
C50	CAPACITOR: same as C48	By-pass at pin 2 of r-f socket	Micamold "W"XM262
C51	CAPACITOR: same as C48	By-pass at pin 4 of r-f socket	Micamold "W"XM262
C52	CAPACITOR: same as C48	By-pass at pin 5 of r-f socket	Micamold "W"XM262

* See footnote on previous page.

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
C53	CAPACITOR: fixed; electrolytic; 8 µf	By-pass for electronic regulator output	Cornell-Dubilier "Beaver" #845
C54	CAPACITOR: fixed; paper; 4 µf; 600 vdcw	B supply filter	Capacitrons CAAT-481080-10
C55	CAPACITOR: fixed; paper; 0.5 µf, ±10%; 600 vdcw; bathtub type can	B supply filter	Cornell-Dubilier DYRT-6050
C56	CAPACITOR: fixed; mica; 300 µµf, ±20%; feed through type	Part of i-f filter in filament circuit of V6 and V7	Cornell-Dubilier Type 742
C57	CAPACITOR: same as C56	Part of i-f filter in filament circuits of V6 and V7	Cornell-Dubilier Type 742
C58	CAPACITOR: fixed; mica; 2000 µµf, ±10%; 400 vdcw	Part of a-c line filter system	Solar type MW1233
C59	CAPACITOR: same as C58	Part of a-c line filter system	Solar type MW1233
C60	CAPACITOR: same as C55	Shunted across a-c line circuit	Cornell-Dubilier DYRT-6050
C61	CAPACITOR: same as C58	Filter capacitor in 6.3 volt filament supply	Solar type MW1233
C62	CAPACITOR: same as C58	Filter capacitor in 6.3 volt filament supply	Solar type MW1233
C63	CAPACITOR: same as C58	Part of vibrator hash filter	Solar type MW1233
C64	CAPACITOR: fixed; paper; 0.5 µf, ±10%; 200 vdcw; bathtub type can	Part of vibrator hash filter	Cornell-Dubilier HC 3228
C65	CAPACITOR: same as C58	Part of vibrator hash filter	Solar type MW1233
C66	CAPACITOR: same as C56	Part of a-c line filter system	Cornell-Dubilier Type 742
C67	CAPACITOR: same as C56	Part of a-c line filter system	Cornell-Dubilier Type 742
C68	CAPACITOR: same as C56	Part of vibrator hash filter	Cornell-Dubilier Type 742
C69	CAPACITOR: same as C12	By-passes positive terminal of MICROVOLT meter	Meas. Corp. Dwg. #Q154
C70	CAPACITOR: same as C12	By-passes negative terminal of MICROVOLT meter	Meas. Corp. Dwg. #Q154
C71	CAPACITOR: same as C56	R-f by-pass at pin 2 of r-f plug	Cornell-Dubilier Type 742
C72	CAPACITOR: same as C56	R-f by-pass at pin 3 of r-f plug	Cornell-Dubilier Type 742
C73	CAPACITOR: same as C58	By-pass at pin 3 of r-f plug	Solar type MW1233
C74	CAPACITOR: same as C58	By-pass at pin 2 of r-f plug	Solar type MW1233
C75	CAPACITOR: same as C56	R-f by-pass at pin 1 of r-f plug	Cornell-Dubilier Type 742
C76	CAPACITOR: same as C56	R-f by-pass at pin 5 of r-f plug	Cornell-Dubilier Type 742
C77	CAPACITOR: same as C56	R-f by-pass at pin 4 of r-f plug	Cornell-Dubilier Type 742

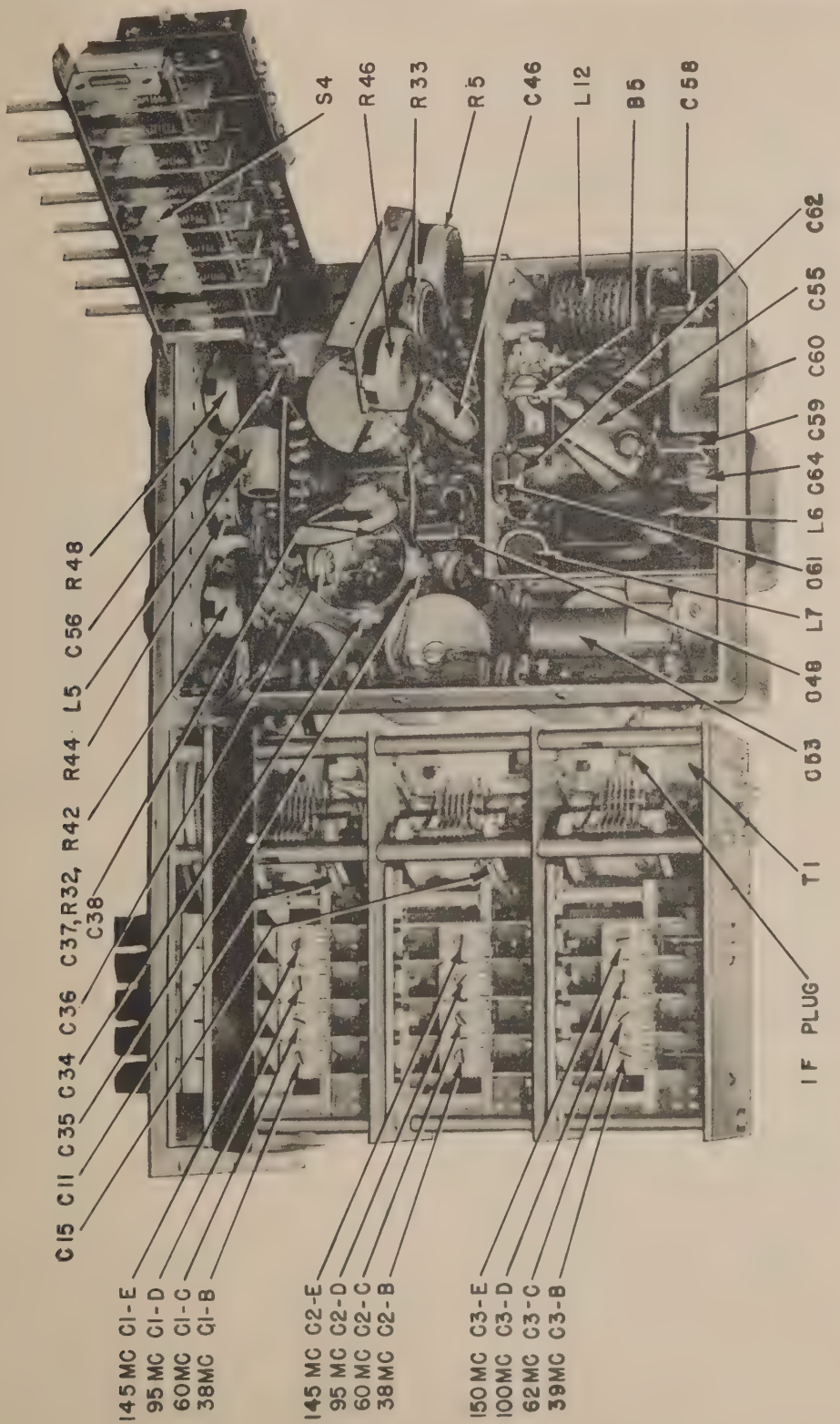


FIGURE 6-1

Under chassis component and replacement details

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
C78	CAPACITOR: same as C58	By-pass at pin 5 of r-f plug	Solar type MW1233
C79	CAPACITOR: same as C58	By-pass at pin 4 of r-f plug	Solar type MW1233
F1	FUSE: standard cartridge type; 3 AG; 1-1/2 ampere	A-c line fuse.	Bussman or Littlefuse type 3 AG 1-1/2
F2	FUSE: same as F1	A-c line fuse.	Bussman or Littlefuse type 3 AG 1-1/2
F3	FUSE: standard cartridge type; 3 AG; 15 ampere	Battery line fuse	Bussman or Littlefuse type 3 AG 15
L1A	COIL, r-f; A band antenna tank and link	A band antenna tank inductance and coupling link. Range 15 to 24 mc	Meas. Corp. Dwg. #B376 Coil AA-1-1
L1B	COIL, r-f: B band antenna tank and link	B band antenna tank inductance and coupling link. Range 24 to 39 mc	Meas. Corp. Dwg. #B377 Coil BA-2-1
L1C	COIL, r-f: C band antenna tank and link	C band antenna tank inductance and coupling link. Range 38 to 62 mc	Meas. Corp. Dwg. #B378 Coil CA-3-1
L1D	COIL, r-f: D band antenna tank and link	D band antenna tank inductance and coupling link. Range 60 to 100 mc	Meas. Corp. Dwg. #B379 Coil DA-4-1
L1E	COIL, r-f: E band antenna tank and link	E band antenna tank inductance and coupling link. Range 98 to 150 mc	Meas. Corp. Dwg. #B380 Coil EA-5-1
L2A	COIL, r-f: A band converter tank and link	A band converter tank inductance and coupling link. Range 15 to 24 mc	Meas. Corp. Dwg. #B376 Coil AR-1-2
L2B	COIL, r-f: B band converter tank and link	B band converter tank inductance and coupling link. Range 24 to 39 mc	Meas. Corp. Dwg. #B377 Coil BR-2-2
L2C	COIL, r-f: C band converter tank and link	C band converter tank inductance and coupling link. Range 38 to 62 mc	Meas. Corp. Dwg. #B378 Coil CR-3-2
L2D	COIL, r-f: D band converter tank and link	D band converter tank inductance and coupling link. Range 60 to 100 mc	Meas. Corp. Dwg. #B379 Coil DR-4-2
L2E	COIL, r-f: E band converter tank and link	E band converter tank inductance and coupling link. Range 98 to 150 mc	Meas. Corp. Dwg. #B380 Coil ER-5-2
L3A	COIL, r-f: A band oscillator tank, link and grid coils	A band oscillator tank inductance, coupling link and grid coil. Range 27 to 36 mc	Meas. Corp. Dwg. #B376 Coil AO-1-3
L3B	COIL, r-f: B band oscillator tank, link and grid coils	B band oscillator tank inductance, coupling link and grid coil. Range 36 to 51 mc	Meas. Corp. Dwg. #B377 Coil BO-2-3
L3C	COIL, r-f: C band oscillator tank, link and grid coils	C band oscillator tank inductance, coupling link and grid coil. Range 50 to 74 mc	Meas. Corp. Dwg. #B378 Coil CO-3-3
L3D	COIL, r-f: D band oscillator tank, link and grid coils	D band oscillator tank inductance, coupling link and grid coil. Range 72 to 112 mc	Meas. Corp. Dwg. #B379 Coil DO-4-3

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REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
L3E	COIL, r-f: E band oscillator tank, link and grid coils	E band oscillator tank inductance, coupling link and grid coil. Range 86 to 138 mc	Meas. Corp. Dwg. #B380 Coil EO-5-3
L4	COIL, choke: 0.01 μh	Part of i-f filter network for filaments of V6 and V7	Fast #A6150 or #P32212
L5	COIL, choke: same as L4	Same as L4	Fast #A6150 or #P32212
L6	COIL, choke: 7 hy; 55 ma; 200 ohms	Part of filter network for high voltage supply	Thordarson T14C61
L7	COIL, choke: same as L4	Part of filter network filament of V2	Fast #A6150 or #P32212
L8	COIL, choke: same as L4	Same as L7	Fast #A6150 or #P32212
L9	COIL, choke:	Part of line filter network assembly #B149	Meas. Corp. Dwg. #C-4
L10	COIL, choke:	Same as L9	Meas. Corp. Dwg. #C-4
L11	COIL, choke:	Part of filament filter mounted with line filter on assembly #B149	Meas. Corp. Dwg. #C-3
L12	COIL, choke:	Part of vibrator filter system	Meas. Corp. Dwg.#C-6
L13	COIL, choke: same as L4	Filter unit in filament supply of V9, V10, and V11	Fast #A6150 or #P32212
R1	RESISTOR, carbon: 36,000 ohms, ±5%; 1 w	Antenna section isolating resistor	Allen Bradley Type "GB"
R2	RESISTOR, carbon: 200,000 ohms, ±10%; 1/2 w	R-f amplifier grid return	Allen Bradley Type "EB"
R3	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of r-f filter in screen grid circuit of V11	Allen Bradley Type "EB"
R4A	RESISTOR, carbon: 10,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V9	Allen Bradley Type "EB"
R4B	RESISTOR, carbon: 10,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V9	Allen Bradley Type "EB"
R4C	RESISTOR, carbon: 10,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V9	Allen Bradley Type "EB"
R4D	RESISTOR, carbon: 5,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V9	Allen Bradley Type "EB"
R4E	RESISTOR, carbon: 5,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V9	Allen Bradley Type "EB"
R5	RESISTOR, carbon: 100 ohms, ±10%; 1/2 w	Isolating resistor in plate circuit of V9	Allen Bradley Type "EB"
R6	RESISTOR, carbon: 20,000 ohms, ±10%; 1/2 w	V9 grid return	Allen Bradley Type "EB"
R7	RESISTOR, carbon: 35,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V11	Allen Bradley Type "EB"
R8	RESISTOR, carbon: 200,000 ohms, ±10%; 1/2 w	V10 grid return	Allen Bradley Type "EB"
R9	RESISTOR, carbon: 500,000 ohms, ±10%; 1/2 w	Dropping resistor for screen grid of V10	Allen Bradley Type "EB"
R10	RESISTOR, carbon: 35,000 ohms, ±10%; 1/2 w	Dropping resistor in plate circuit of V10	Allen Bradley Type "EB"

SEE ERRATA SHEET, FRONT

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
R11	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of r-f filter in antenna. section tank circuit	Allen Bradley Type "EB"
R12	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of r-f filter in screen grid circuit of V11	Allen Bradley Type "EB"
R13	RESISTOR, carbon: 115 ohms, ±10%; 1/2 w	Part of r-f filter in filament circuit of V12	Allen Bradley Type "EB"
R14	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of r-f filter in plate circuit of V10	Allen Bradley Type "EB"
R15	RESISTOR, carbon: 3,000 ohms, ±10%; 1/2 w	Part of i-f filter in grid circuit of V1	Allen Bradley Type "EB"
R16	RESISTOR, carbon: 200 ohms, ±10%; 1/2 w	Part of i-f filter in cathode circuit of V1	Allen Bradley Type "EB"
R17	RESISTOR, carbon: 30,000 ohms, ±10%; 1/2 w	Dropping resistor in screen grid circuit of V1	Allen Bradley Type "EB"
R18	RESISTOR, carbon: 35,000 ohms, ±10%; 1/2 w	Bleeder resistor in screen grid circuit of V1	Allen Bradley Type "EB"
R19	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V1	Allen Bradley Type "EB"
R20	RESISTOR, carbon: 75,000 ohms, ±5%; 1/2 w	Damping resistor in primary circuit of T3	Allen Bradley Type "EB"

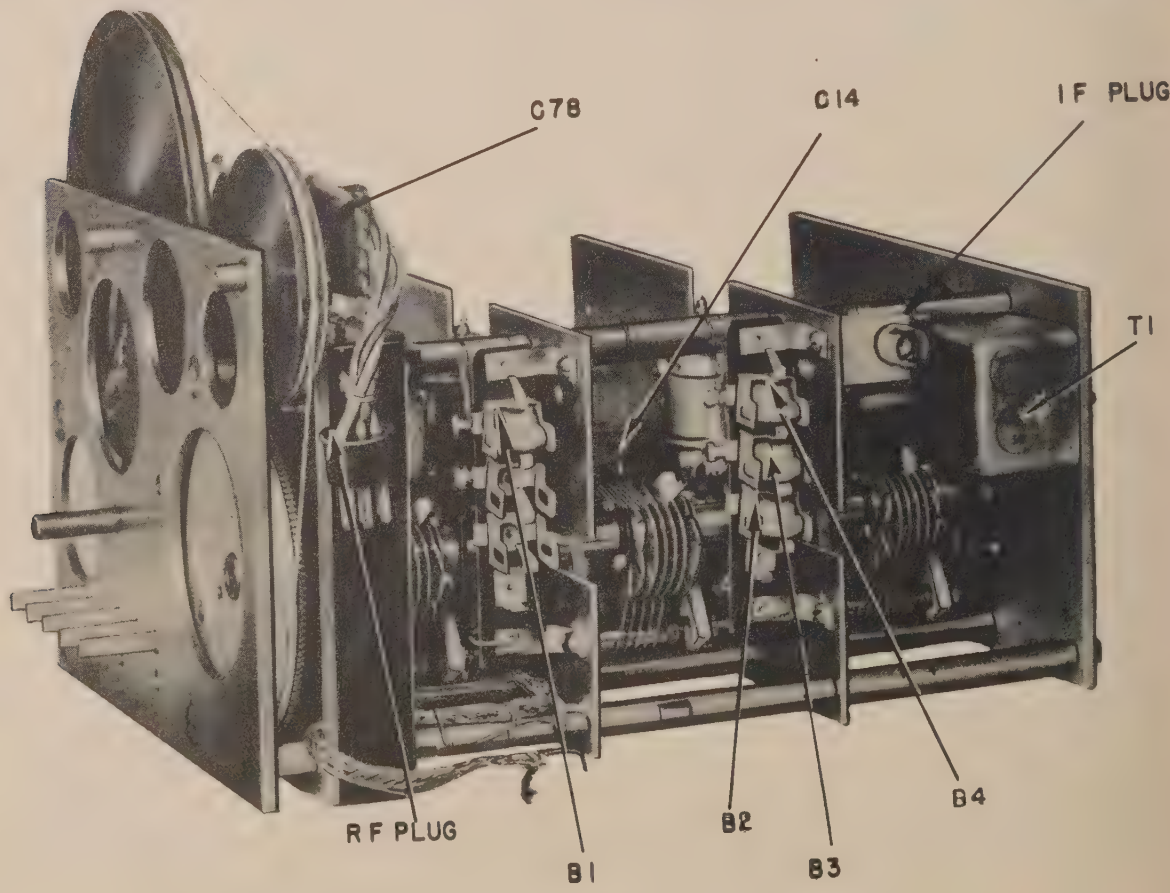

FIGURE 6-2

Dial drive and r-f assembly showing bias cell locations and replacements

SEE ERRATA SHEET, FRONT
SECTION OF MANUAL

REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
R21	RESISTOR, carbon: 75,000 ohms, ±5%; 1/2 w	Damping resistor in secondary circuit of T3	Allen Bradley Type "EB"
R22	RESISTOR, carbon: 200 ohms, ±10%; 1/2 w	Part of i-f filter in cathode circuit of V3	Allen Bradley Type "EB"
R23	RESISTOR, carbon: 30,000 ohms, ±10%; 1/2 w	Dropping resistor in screen grid circuit of V3	Allen Bradley Type "EB"
R24	RESISTOR, carbon: 35,000 ohms, ±10%; 1/2 w	Bleeder resistor in screen grid circuit of V3	Allen Bradley Type "EB"
R25	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V3	Allen Bradley Type "EB"
R26	RESISTOR, carbon: 3,000 ohms, ±10%; 1/2 w	Part of i-f filter in grid circuit of V3	Allen Bradley Type "EB"
R27	RESISTOR, carbon: 75,000 ohms, ±5%; 1/2 w	Damping resistor in primary circuit of T4	Allen Bradley Type "EB"
R28	RESISTOR, carbon: 75,000 ohms, ±5%; 1/2 w	Damping resistor in secondary circuit of T4	Allen Bradley Type "EB"
R29	RESISTOR, carbon: 200 ohms, ±10%; 1/2 w	Cathode bias resistor for V6	Allen Bradley Type "EB"
R30	RESISTOR, carbon: 35,000 ohms, ±10%; 1/2 w	Dropping resistor in screen grid circuit of V6	Allen Bradley Type "EB"
R31	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V6	Allen Bradley Type "EB"
R32	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V6	Allen Bradley Type "EB"
R33	RESISTOR, variable: carbon; 2.5 megohms, ±10%; log taper	Factory adjustment for automatic volume control	Meas. Corp. Dwg. A264 Pt. 1
R34	RESISTOR, carbon: 3.5 megohms, ±10%; 1/2 w	Part of avc output voltage divider	Allen Bradley Type "EB"
R35	RESISTOR, carbon: 500 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V7	Allen Bradley Type "EB"
R36	RESISTOR, carbon: 1,000 ohms, ±10%; 1/2 w	Part of i-f filter in plate circuit of V7	Allen Bradley Type "EB"
R37	RESISTOR, carbon: 1 megohm, ±10%; 1/2 w	Protective resistor in grid circuit of V4	Allen Bradley Type "EB"
R38	RESISTOR, carbon: 10,000 ohms, ±10%; 1/2 w	Isolating resistor in PHONES jack circuit	Allen Bradley Type "EB"
R39	RESISTOR, carbon: 550 ohms, ±10%; 1/2 w	Substitutes for external recorder resistance when recorder is not used.	Allen Bradley Type "EB"
R40	RESISTOR, carbon: 7,500 ohms; ±10%; 1 w	Part of voltage divider in MICROVOLT meter circuit	Allen Bradley Type "GB"
R41	RESISTOR, carbon: 5,000 ohms, ±10%; 1/2 w	Part of voltage divider in MICROVOLT meter circuit	Allen Bradley Type "EB"
R42	RESISTOR, variable: wire wound; 10,000. ohms, ±20%; linear taper	Provides panel adjustment of MICROVOLT meter zero	Meas. Corp. Dwg. A261 Pt. 2
R43	RESISTOR, carbon: 15,000 ohms, ±10%; 1 w	Part of voltage divided in MICROVOLT meter circuit	Allen Bradley Type "GB"
R44	RESISTOR, variable: carbon; 100,000 ohms, ±10%; log taper	Provides panel adjustment to control sensitivity of receiver (CAL)	Meas. Corp. Dwg. A263 Pt. 1
R45	RESISTOR, carbon: 50,000 ohms, ±10%; 1/2 w	Limits control of R44	Allen Bradley Type "EB"

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REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
R46	RESISTOR, variable: wire wound; 1,000 ohms, ±20%; linear taper	Factory adjustment for cathode bias of V1 and V3	Meas. Corp. Dwg. A262 Pt. 3
R47	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Part of r-f filter at pin #5 of r.f. Socket	Allen Bradley Type "EB"
R48	RESISTOR, variable: wire wound; 75 ohms, ±20%; linear taper	Provides panel adjustment of V12, filament circuit (ADJ)	Meas. Corp. Dwg. A261 Pt. 1
R49	RESISTOR, carbon: 5,000 ohms, ±10%; 1/2 w	Limits range of R50	Allen Bradley Type "EB"
R50	RESISTOR, variable: wire wound; 10,000 ohms, ±10%; linear taper	Factory adjustment of electronic regulator output voltage (B+)	Meas. Corp. Dwg. A262 Pt. 2
R51	RESISTOR, carbon: 50,000 ohms, ±10%; 1/2 w	Limits range of R50	Allen Bradley Type "EB"
R52-A	RESISTOR, carbon: 75,000 ohms, ±10%; 1/2 w	Supplies and limits starting current for neon tube	Allen Bradley Type "EB"
R52-B	RESISTOR, carbon: 51,000 ohms, ±5%; ½w	Supplies and limits starting current for neon tube	Allen Bradley Type "EB"
R53	RESISTOR, carbon: 500,000 ohms, ±10%; 1/2 w	Couples cathode of V5 to plate of V8 regulator tube	Allen Bradley Type "EB"
R54	RESISTOR, carbon: 500,000 ohms, ±10%; 1/2 w	Screen grid dropping resistor for V8	Allen Bradley Type "EB"
R55	RESISTOR, carbon: 300 ohms, ±10%; 1/2 w	Screen grid dropping resistor for V5	Allen Bradley Type "EB"
R56	RESISTOR, carbon: 150 ohms, ±10%; 1/2 w	Damping resistor to reduce vibrator contact arc	Allen Bradley Type "EB"
R57	RESISTOR, carbon: 39.6 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R58	RESISTOR, carbon: 39.6 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R59	RESISTOR, carbon: 250 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R60	RESISTOR, carbon: 250 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R61	RESISTOR, carbon: 43.2 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R62	RESISTOR, carbon: 43.2 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R63	RESISTOR, carbon: 356 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R64	RESISTOR, carbon: 356 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R65	RESISTOR, carbon: 43.2 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R66	RESISTOR, carbon: 43.2 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R67	RESISTOR, carbon: 356 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R68	RESISTOR, carbon: 356 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
R69	RESISTOR, carbon: 39.6 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"

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REF. SYMBOL	NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
R70	RESISTOR, carbon: 39.6 ohms, ±1%; 1/2 w	Part of input attenuator	Allen Bradley Type "EB"
S1	SWITCH, push-button: five button; 30 silver plated contact clips	Antenna section of frequency range switch; push rods actuate S2 and S3	Meas. Corp. Dwg. B1188
S2	SWITCH, push-button: five button; 30 silver plated contact clips	Converter section of frequency range switch; push rods actuate S1 and S3	Meas. Corp. Dwg. #B196
S3	SWITCH, push-button: five button; 30 silver plated contact clips	Oscillator section of frequency range switch	Meas. Corp. Dwg. #B196
S4	SWITCH, push-button: eight button; 38 silver plated contact clips; one DPST power switch actuated by button #8	Operation switch for selecting attenuator steps, ZERO, CAL, ADJ and OFF circuits.	Meas. Corp. Dwg. #B198
S5	SWITCH, toggle: SPST	Selects AVERAGE or PEAK response of MICROVOLT meter circuit	Hart & Hegeman or equiv.
V1	VACUUM TUBE: type 7W7	First i-f	Sylvania 7W7 or equiv.
V2	VACUUM TUBE: type 6X5 or 6X5GT/G	Full wave rectifier for plate supply	RCA 6X5 or 6X5GT/G or equiv.
V3	VACUUM TUBE: type 7W7	Second i-f	Sylvania 7W7 or equiv.
V4	VACUUM TUBE: type 6J5 or 6J5GT/G	Amplifier for MICROVOLT meter, recorder and headphones	RCA 6J5 or 6J5GT/G or equiv.
V5	VACUUM TUBE: type 6Y6G	Regulator	RCA 6Y6G or equiv.
V6	VACUUM TUBE: type 7W7	Third i-f	Sylvania 7W7 or equiv.
V7	VACUUM TUBE: type 6H6	Detector	RCA 6H6 or equiv.
V8	VACUUM TUBE: type 6SJ7 or 6SJ7GT/G	Regulator	RCA 6SJ7 or 6SJ7GT/G or equiv.
V9	VACUUM TUBE: type 955	Oscillator	RCA 955 or equiv.
V10	VACUUM TUBE: type 6AK5	Converter	RCA 6AK5 or equiv.
V11	VACUUM TUBE: type 6AK5	R-f amplifier	RCA 6AK5 or equiv.
V12	VACUUM TUBE: type M74*	Source of r-f shot noise for calibration	Zenith M74* or equiv.
Neon	TUBE: type 991	Bias regulator	Kuthe Lab. Neon 991 or equiv.

* Early Model 58's used the type 958 tube as a shot noise-diode with plate and grid tied together.

6.2 MISCELLANEOUS MECHANICAL PARTS

NAME OF PART & DESCRIPTION	FUNCTION	MFG. & DESIG.
BUTTONS, push: engraved frequency ranges and operation controls	Operate all switches except toggle	Meas. Corp. Dwg.#A133
COVER, dial	CALIBRATION number dial cover; CALIBRATION fiducial	Meas. Corp. Dwg.#A129
COVER, meter	MEGACYCLE dial cover	Simpson Model 29S Meterfront
KNOBS: white dot	For ZERO potentiometer (R42) For CAL potentiometer (R44) For ADJ potentiometer (R75)	Meas. Corp. Dwg.#A134
MEGACYCLE DIAL POINTER	Traverses MEGACYCLE scale to indicate frequency	Crowe #50-33 (black) Modified by Meas. Corp.
METER: 0-5 ma, calibrated 0-100 μv	Output indicator	Simpson Model 29-S
SOCKET AND BRACKET ASSEMBLY for tubes V10 and V11	For converter and r-f amplifier tube	Meas. Corp. Dwg.#A1111
TUNING KNOB ASSEMBLY	Operates MEGACYCLE dial pointer and tuning condenser	Meas. Corp. Dwg.#A109
VIBRATOR, interrupter: separate driving type; nominal input volts 6, max. input amps. 4; operating frequency 100 c ±7c	Interrupts d-c battery for transformer step-up	Oak 6-volt V-6157 Meas. Corp. Dwg.#A1141

6.3 STANDARD AND OPTIONAL ACCESSORIES.-

NAME OF PART AND DESCRIPTION	OVERALL DIMENSIONS (approx.)	FUNCTION	MFG. & DESIG.
ACCESSORY CASE: 1/4-inch plywood; black fabricoid inside and out	40 by 10 by 3 in.	Storing and carrying standard and accessory equipment	Meas. Corp. Dwg.#B217
A-C POWER CABLE: two stranded conductors, rubber insulated; six-contact female connector at one end, fused male plug at other end	Length - 10 ft.	A-c power connection connects to six-contact male receptacle on Model 58	Meas. Corp. Dwg.#A107
ANTENNA CABLE, 3 ft.: 72 ohm shielded dual coaxial male connector on one end and a 3-binding post assembly at other end	Length - 3 ft.	Connects Model 58 to required antenna	Meas. Corp. Dwg.#A213
ANTENNA RODS, LONG: 3 sections with engraved frequency calibration	Length - each 3 ft.	Half of doublet antenna pick-up in frequency range 28 to 80 mc	Meas. Corp. Dwg.#A220, Pt. 1
ANTENNA RODS, SHORT: 2 sections, adjustable, engraved frequency calibration	Length - each 18 in.	Half of doublet antenna pickup in frequency range 80 to 150 mc	Meas. Corp. Dwg.#A220, Pt. 2
BATTERY CABLE: two stranded conductors, rubber insulated; six-contact female connector at one end, 25-ampere battery clips at other end; 15-ampere fuse in positive lead	Length - 6 ft.	D-c power connection connects to six-contact male receptable on Model 58	Meas. Corp. Dwg.#A108
CAPACITY PROBE ANTENNA: bakelite tube; 3-inch wire	Length - 3-1/2 in.	For locating and evaluating stray fields from ignition and other electrical and electronic apparatus	Meas. Corp. Dwg.#A212

NAME OF PART AND DESCRIPTION	OVERALL DIMENSIONS (approx.)	FUNCTION	MFG. & DESIG.
DOUBLET EXTENSION TUBE: bakelite; tapered; brass collar on one end	Length - 3 ft. Diameter - 3/4 in.	Part of doublet antenna stand; supports and adjust height of doublet antenna	Meas. Corp. Dwg. #A1165, Pt. 1
DOUBLET EXTENSION TUBE: baktlite; tapered; plated collar on one end	Length - 3 ft. Diameter - 7/8 in.	Part of doublet antenna stand; supports and adjust height of doublet antenna	Meas. Corp. Dwg. #A1165, Pt. 2
DOUBLET EXTENSION TUBE: bakelite; plated collars on both ends	Length - 3 ft. Diameter - 1 in.	Part of doublet antenna stand; supports and adjust height of doublet antenna	Meas. Corp. Dwg. #A1165, Pt. 3
DOUBLET ANTENNA STAND: collapsible tripod		Part of doublet antenna; supports doublet extension tubes and doublet antenna	Meas. Corp. Dwg.#A1108
DOUBLET ANTENNA HOLDER: clamp, holder with special screws; six-inch long 72-ohm dual coaxial cable; female connector on one end		Part of doublet antenna; provides connection between antenna rods, antenna cable and Model 58; provides swivel adjustment for vertical or horizontal polarization	Meas. Corp. Dwg.#A215
HEADPHONE ASSEMBLY: Navy type 490124 cord and CN-49034A Phone Plug; 17000 ohms per pair		Monitors signal	"Trimm" Feather weight #157
LOOP ANTENNA, 3-inch: electrostatic shield; one turn of insulated wire; cylindrical bracket with female connector insert	Diameter - 3 in.	Determines direction of current flow and locates leaks in ignition shielding, etc.	Meas. Corp. Dwg.#A211
LOOP ANTENNA, 9-inch: electrostatic shield; one turn of insulated wire; cylindrical bracket with female connector insert	Diameter - 9 in.	For noise and field strength measurements	Meas. Corp. Dwg.#A110.

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